



National Aeronautics and
Space Administration

Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

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AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY
WITH INDEXES**

(Supplement 327)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in August 1989 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*.



National Aeronautics and Space Administration
Office of Management
Scientific and Technical Information Division
Washington, DC

1989

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 127 reports, articles and other documents announced during August 1989 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1989 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

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TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED

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ON MICROFICHE

ACCESSION NUMBER → **N89-11384*** # Houston Univ., Tex. Dept. of Biology. ← CORPORATE SOURCE

TITLE → **GROWTH OF PLANT TISSUE CULTURES IN SIMULATED LUNAR SOIL: IMPLICATIONS FOR A LUNAR BASE CELSS (CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM) Final Report, 1 Feb. 1987 - 31 Jul. 1988**

AUTHOR → S. VENKETESWARAN 1988 65 p (Contract NAG9-214) ← PUBLICATION DATE

REPORT NUMBERS → (NASA-CR-183233; NAS 1.26:183233) Avail: NTIS HC A04/MF ← PRICE CODE

COSATI CODE → A01 CSCL 06C ← AVAILABILITY SOURCE

Experiments were carried out on plant tissue cultures, seed germination, seedling development and plants grown on Simulated Lunar Soil to evaluate the potential of future development of lunar based agriculture. The studies done to determine the effect of the placement of SLS on tissue cultures showed no adverse effect of SLS on tissue cultures. Although statistically insignificant, SLS in suspension showed a comparatively higher growth rate. Observations indicate the SLS, itself cannot support calli growth but was able to show a positive effect on growth rate of calli when supplemented with MS salts. This positive effect related to nutritive value of the SLS was found to have improved at high pH levels, than at the recommended low pH levels for standard media. Results from seed germination indicated that there is neither inhibitory, toxicity nor stimulatory effect of SLS, even though SLS contains high amounts of aluminum compounds compared to earth soil. Analysis of seeding development and growth data showed significant reduction in growth rate indicating that, SLS was a poor growth medium for plant life. This was confirmed by the studies done with embryos and direct plant growth on SLS. Further observations attributed this poor quality of SLS is due to it's lack of essential mineral elements needed for plant growth. By changing the pH of the soil, to more basic conditions, the quality of SLS for plant growth could be improved up to a significant level. Also it was found that the quality of SLS could be improved by almost twice, by external supply of major mineral elements, directly to SLS. Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

NASA SPONSORED

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ACCESSION NUMBER → **A89-11286*** Maryland Univ., Baltimore.

TITLE → **PROGRAMMED ENVIRONMENT MANAGEMENT OF CONFINED MICROSOCIETIES** ← AUTHOR'S AFFILIATION

AUTHOR → HENRY H. EMURIAN (Maryland, University, Baltimore) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59,

JOURNAL TITLE → Oct. 1988, p. 976-980. refs

PUBLICATION DATE → (Contract NGR-21-001-111; N00014-80-C-0467)

A programmed environment is described that assists the implementation and management of schedules governing access to all resources and information potentially available to members of a confined micro-society. Living and work schedules are presented that were designed to build individual and group performance repertoires in support of study objectives and sustained adaptation by participants. A variety of measurement requirements can be programmed and standardized to assure continuous assessment of the status and health of a confined micro-society. Author

AEROSPACE MEDICINE AND BIOLOGY

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SEPTEMBER 1989

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LIFE SCIENCES (GENERAL)

A89-36116

RETICULOENDOTHELIAL PHAGOCYtic ACTIVITY IN HIGH-ALTITUDE ACCLIMATIZED RATS

PIPAT CHERDRUNGSI (Mahidol University, Bangkok, Thailand) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 60, April 1989, p. 329-331. refs

Experiments were undertaken with rats to determine the effect of chronic exposure to a simulated high altitude of 5000 m on phagocytic activity of the reticuloendothelial system (RES). Phagocytic index (K) was determined by measuring the rate of blood clearance of colloidal carbon given intravenously. K value of the chronically altitude exposed rats was found to be greater than that of the sea-level control animals (p less than 0.02), indicating that acclimatization to high altitude stimulated the RES phagocytosis. On analysis of the weights of the liver and spleen, the corrected phagocytic index (α) of the high altitude-acclimatized rats was also found to be higher than that of the sea-level control animals (p less than 0.05), while the weights of the liver and spleen expressed in percent body weight were not affected by high altitude exposure. The increased number of carbon-containing Kupffer cells in the liver and the increased phagocytic indices (both K and α values) suggested that most of the increase in RES phagocytic activity was due to increased RES tissue activity per unit mass of tissue rather than tissue hypertrophy. Author

A89-37500

THE RESONANCE EFFECT OF COHERENT ELECTROMAGNETIC MILLIMETER-RANGE WAVES ON LIVING ORGANISMS [O PROBLEME REZONANSNOGO DEISTVIA KOGERENTNYKH ELEKTROMAGNITNYKH IZLUCHENII MILLIMETROVOGO DIAPAZONA VOLN NA ZHIVYE ORGANIZMY]

M. B. GOLANT *Biofizika* (ISSN 0006-3029), vol. 34, Mar.-Apr. 1989, p. 339-348. In Russian. refs

Results of experimental studies concerned with the mechanisms of acute effects of low-dose-rate coherent millimeter waves on living organisms are reviewed. The effect of this type of radiation on the functioning of monocellular and multicellular organisms and subcellular systems is discussed. I.S.

A89-37673* Hawaii Univ., Honolulu.

CARBON RECYCLING IN MATERIALLY CLOSED ECOLOGICAL LIFE SUPPORT SYSTEMS

D. C. OBENHUBER and C. E. FOLSOME (Hawaii, University, Honolulu) *BioSystems* (ISSN 0303-2647), vol. 21, 1988, p. 165-173. Research supported by the University of Hawaii. refs (Contract NGR-12-001-109)

Results of studies are presented of materially closed energetically open microbial ecosystems or 'closed ecosystems'. These are natural marine ecosystems that have been sealed in glass containers to prevent material exchange with the environment

but allow energy to pass freely through them. They represent model life support systems for the future human habitation of space. The results are discussed analytically and indicate that these ecosystems, when subjected to a constant energy flux, seem to be reliable and self-sufficient systems for recycling of biologically produced carbon compounds. S.A.V.

A89-37674* Louisville Univ., KY.

EFFECTS OF INTERFERON-GAMMA AND TUMOR NECROSIS FACTOR-ALPHA ON MACROPHAGE ENZYME LEVELS

SILVIA S. PIERANGELI and GERALD SONNENFELD (Louisville, University, KY) *Journal of Interferon Research* (ISSN 0197-8357), vol. 9, 1989, p. 1-9. refs (Contract NAG9-81)

Murine peritoneal macrophages were treated with interferon-gamma (IFN-gamma) or tumor necrosis factor-alpha (TNF). Measurements of changes in acid phosphatase and beta-glucuronidase levels were made as an indication of activation by cytokine treatment. IFN-gamma or TNF-gamma treatment resulted in a significant increase in the activities of both enzymes measured in the cell lysates. This increase was observable after 6 h of incubation, but reached its maximum level after 24 h of incubation. The effect of the treatment of the cell with both cytokines together was additive. No synergistic effect of addition of both cytokines on the enzyme levels was observed. Author

A89-38346

VESTIBULAR PROJECTION SITES IN THE CORPUS CALLOSUM OF CATS

HIROTAKA SATAKE, TAKASHI KAWASHIMA, and KEN'ICHI MATSUNAMI (Gifu University, Japan) IN: *International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2313-2318. refs*

The vestibular projection area in the corpus callosum of anaesthetized cats was studied in an attempt to better understand the role of vestibular signals in space motion sickness. The results indicated that the vestibular nerve stimulation evoked short latency potentials in the corpus callosum, suggesting that the vestibular signals are conveyed interhemispherically through the corpus callosum. Thus, they play a significant role in space orientation. K.K.

A89-38348

DORSAL LIGHT TILT RESPONSE AND CEREBELLAR ACTIVITY OF CARP UNDER MICROGRAVITY INDUCED BY AIRCRAFT PARABOLIC FLIGHT

SHIGEO MORI, SATORU WATANABE, MASAFUMI TANAKA, KAZUO KOGA, SADAHARU TAKAGI (Nagoya University, Japan) et al. IN: *International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2325-2329. refs*

The dorsal light tilt response (DLTR) and electrical activities of the cerebellum were examined for intact and otolith-removed carp under parabolic-flight microgravity in 1986 and 1987. The DLTR was completely light-dependent in both carp as if it was controlled by a simple balancing system which could equalize the input of light intensity to both eyes. The tilt speed successfully measured in one intact carp was high enough to be comparable with that of

otolith-removed fish on the ground, but was much more steady. A power spectral analysis of the cerebellar activity could be made only for the otolith-removed fish, demonstrating an enhancement of the power at frequency ranges below 8 Hz and between 12-25 Hz. Author

A89-38349**EFFECTS OF CENTRIFUGAL ACCELERATION UPON THE BRAIN ACTIVITIES IN HAMSTER**

YOSHIO MIZUNO (Daido Institute of Technology, Nagoya, Japan), HIROTAKE SATAKE, KEN'ICHI MATSUNAMI (Gifu University, Japan), HIROHIDE URANO (Fukui Medical School, Japan), and SATORU WATANABE (Nagoya University, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2331-2335. refs

The effect of extreme hypergravity on the brain activities of hamsters is investigated. A centrifuge was used to expose the hamsters to 2 G, 3 G, and 4 G hypergravic fields. Changes in heart rate and respiratory rate were studied as well as changes in spontaneous EEG and VEPs (visual evoked potentials). The effects of hypergravity on brain activities varied in accordance with the acting axis of the hamster. K.K.

A89-38350**RESPONSE OF RATS TO SHORT- AND LONG-TERM CENTRIFUGAL ACCELERATION**

MASAMICHI SUDOH, KUMIKO SHIODA, SACHIO IKAWA (Jikei University, Tokyo, Japan), and HISASHI SAIKI (Saint Marianna University, Kawasaki, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2337-2342. refs

The physiological changes in rats exposed to hypergravity for 30 min and 3 weeks are studied. Changes in respiratory and circulatory functions are of particular interest. In the short-term experiment, female rats were exposed to hypergravity in intensities of 3, 4, 5, and 6 G in the following directions: back-to-abdomen (-Gx), head-to-tail (+Gz), and tail-to-head (-Gz). While the heart rate did not change during the -Gx and +Gz exposures, it showed a slight decrease during the -Gz exposure. K.K.

A89-38351**FREE FALL EXPERIMENTS ON SWIMMING BEHAVIOR OF CILIATES**

YOSHIIHIRO MOGAMI, TAKAKO KIMURA, SHOJI A. BABA (Ochanomizu University, Tokyo), MAKOTO OKUNO (Tokyo, University, Komaba, Japan), and MASAMICHI YAMASHITA (Institute of Space and Astronautical Science, Sagami, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2351-2354. refs

Free-fall experiments are used to study the behavior of ciliate protozoa under different gravitational conditions. Ciliates such as the Paramecium caudatum and the Tetrahymena pyriformis exhibit negative geotaxis under the 1 G condition. The swimming speed is found to decrease for paramecia during short free-fall periods. K.K.

A89-38352**OBSERVATION OF LIVING CELLS AT ALTERED GRAVITY**

KAZUKO OZAWA, ATSUSHIGE SATO (Tokyo Medical and Dental University, Japan), and TOHRU NAKAJIMA IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2355-2360. Research supported by the Science and Technology Agency of Japan. refs

The effect of hypergravity on the motility of MC-3T3 cells and JTC-12 cells in different cell cycle phases is investigated. The cells were centrifuged at 5 and 18 xg and were observed at two hour intervals using a phase-contrast microscope. The cell motility was more significant in the S phase than in the G1 phase of the

cell cycle and the motility of MC-3T3 cells was more significant than that of JTC-12 cells. The results indicate that cell motility is enhanced by hypergravity. K.K.

A89-38353**DEVELOPMENTAL BIOLOGY OF FISH ONBOARD A SMALL SPACE PLATFORM (SFU)**

KEN-ICHI IJIRI (Tokyo, University, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2361-2366. refs

Biology experiments to be conducted aboard a small unmanned space platform (a space flyer unit) launched by Japan are described. One experiment will attempt to determine whether or not the early development of fish (processes from fertilization to hatching) can take place normally under microgravity conditions. Ground-based experiments using the Medaka (*Oryzias latipes*) fish are described in detail with attention given to the selection of the best pairs for the SFU, low temperature treatment and spawning, and the effect of radiation on embryonic development. K.K.

A89-38354**FUNDAMENTALS OF PLANT EXPERIMENTS IN SPACE**

HIDEYUKI TAKAHASHI and HIROSHI SUGE (Tohoku University, Sendai, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2367-2372. refs

The role of auxin in the initiation of tropistic response is studied as well as the characteristics of auxin transport in the epicotyls of an agravitropic mutant pea, ageotropum. The ethylene production capability of the mutant tissues was compared to that of a normal pea (Alaska) since the auxin-induced ethylene caused by auxin redistribution was found to contribute to shoot gravitropism. It was found that the lateral indole-3-acetic acid redistribution arising from the gravitational stimulus did not occur in the epicotyls of a mutant pea ageotropum, while it was obvious in Alaska epicotyls. K.K.

A89-38355**ANIMAL CELL CULTURE IN SPACE**

ATSUSHIGE SATO and YASUHIRO KUMEI (Tokyo Medical and Dental University, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2373-2377. Research supported by the Science and Technology Agency of Japan. refs

The effects of hypergravity on the proliferation and gene expression of mammalian cells are studied. The HeLa and JTC-12 cells were cultured at 18, 35, and 70 x g for up to 4 days. The gravity-dependent stimulation of cell proliferation and H-3 thymidine incorporation was observed at 18 and 35 x g in HeLa and JTC-12 cells. It is believed that hypergravity activates c-myc gene expression, ultimately promoting cell proliferation. K.K.

A89-38495**SYMPATHETIC NERVOUS SYSTEM AND BODY TEMPERATURE REGULATION IN ENDOTHERMIC ANIMALS [SIMPATICHESKAIA NERVNAIA SISTEMA I REGULIATSIIA TEMPERATURY TELA U ENDOTERMNYKH ZHIVOTNYKH]**

V. N. GURIN (AN BSSR, Institut Fiziologii, Minsk, Belorussian SSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 20, Apr.-June 1989, p. 3-25. In Russian. refs

Results are presented on investigations of the effects of high and low temperatures on the activity of the sympathetic nervous system (SNS) in endothermic animals. It is shown that the thermoregulatory processes (i.e., heat production in hypothermia and heat emission in hyperthermia) and the processes of metabolic adaptation are characterized by morphological changes in SNS cells and that these processes are well-coordinated. The SNS and catecholamines are shown to participate in the redistribution of the blood flow and in the genesis of the pyrexia reaction. It is suggested that the SNS plays a major role in the heat-exchange reactions of the type-E prostaglandins. I.S.

A89-38496

THE NEURON ENSEMBLE - CONCEPT, EXPERIMENT, THEORY [NEIRONNYI ANSAMBL' - IDEIA, EKSPERIMENT, TEORIIA]

O. G. CHORAIAN (Rostovskii Gosudarstvennyi Universitet, Rostov-on-Don, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 20, Apr.-June 1989, p. 75-95. In Russian. refs

The concept of the cooperative functioning of cortical structures is discussed together with the results of experimental studies on the interaction of neurons from various neuronal units at different functional states. Various mathematical models for the analysis of cerebral neuronal nets are described. A comparison of the characteristics of neuronal ensembles of the central region of the visual analyzer of the frog is presented, showing good agreement with values obtained by theoretical analysis. I.S.

A89-38900

MICROGRAVITY EFFECTS ON PLANT GROWTH AND LIGNIFICATION

JOE R. COWLES, RICHARD LEMAY, and GARY JAHNS (Houston, University, TX) Astrophysical Letters and Communications (ISSN 0888-6512), vol. 27, no. 3, 1988, p. 223-228. refs

Lignin is a major cellular component of higher plants. One function of lignin is to support vertical plant growth in a gravity environment. Various investigators working in the 1 g environment have concluded that lignification is influenced by gravity. An experiment was designed for flight on Spacelab II to determine the effect of microgravity on lignification in young plant seedlings. A secondary objective of the experiment was to examine the effect of microgravity on overall seedling growth. Mung bean and oat seeds germinated and the seedlings grew during the Spacelab II mission. Growth of flight mung bean and oat seedlings, however, was slower, and the seedlings exhibited stem and root orientation difficulties. Flight pine seedlings were similar in appearance and growth to 1 g controls. The rate of lignin formation in seedlings grown in space was significantly less in all three species in comparison to 1 g controls. The experiment provided direct evidence that lignification is slowed in a microgravity environment.

Author

A89-39179

THE EFFECT OF TRAINING IN DIFFERENT THERMAL CONDITIONS ON THE OSMOTIC ACTIVITY OF SERUM AND MUSCLE TISSUE [WPLYW WYSILKU W ROZNYCH WARUNKACH TERMICZNYCH NA AKTYWNOŚĆ OSMOTYCZNA SUROWICY I TKANKI MIĘSNIOWEJ]

KRZYSZTOF BOMBICKI (Akademia Medyczna, Poznan, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 21, no. 3-4, 1988, p. 55-60. In Polish. refs

Experiments were conducted on Wistar rats, divided into four groups: a control group and three groups, trained at temperatures of 5, 20, and 40 C, respectively. A microtechnique employing Fiske's device was used to determine the osmotic activity of the serum and muscle tissue. The greatest osmotic activity was found in the group of animals trained at 40 C for 20 days. B.J.

A89-39390

STIMULATED ACTIVITY MEDIATES PHASE SHIFTS IN THE HAMSTER CIRCADIAN CLOCK INDUCED BY DARK PULSES OR BENZODIAZEPINES

O. VAN REETH and F. W. TUREK (Bruxelles, Universite Libre, Brussels, Belgium; Northwestern University, Evanston, IL) Nature (ISSN 0028-0836), vol. 339, May 4, 1989, p. 49-51. Research supported by the Ministere de la Politique Scientifique de Belgique, NIH, Upjohn Co., and FNRS. refs

It is demonstrated that the phase-advancing and phase-delaying effects of dark pulses or triazolam on the circadian activity rhythm can be totally suppressed by immobilization of experimental animals during treatment. These results indicate that behavioral events mediate the phase-shifting effects of both dark pulses and triazolam on the circadian activity rhythm. They also put into question present hypotheses regarding the pathways by which light-dark information

and pharmacological agents influence circadian pacemakers.

C.D.

A89-39762

DISTRIBUTION OF METALS IN BACTERIA AND ANIMALS OF UNDERWATER HYDROTHERMAL FIELDS [RASPREDELENIE METALLOV V BAKTERIIAKH I ZHIVOTNYKH PODVODNYKH GIDROTHERMAL'NYKH POLEI]

A. I. LEIN, E. M. SEDYKH, N. P. STARSHINOVA, A. Z. MIKLISHANSKII, S. V. GALKIN (AN SSSR, Institut Geokhimi i Analiticheskoi Khimii and Institut Okeanologii, Moscow, USSR) et al. Geokhimiia (ISSN 0016-7525), Feb. 1989, p. 297-302. In Russian. refs

N89-22298# Fish and Wildlife Service, Fort Collins, CO. National Ecology Research Center.

EFFECTS OF AIRCRAFT NOISE AND SONIC BOOMS ON DOMESTIC ANIMALS AND WILDLIFE: A LITERATURE SYNTHESIS

KAREN M. MANCI, DOUGLAS N. GLADWIN, RITA VILLELLA (Fish and Wildlife Service, Kearneysville, WV.), and MARY G. CAVENDISH Jun. 1988 97 p Sponsored by Air Force Engineering and Services Center, Tyndall AFB, FL (PB89-115026; NERC-88/29; AFESC-TR-88-14) Avail: NTIS HC A05/MF A01 CSCL 06C

An information base on the effects of aircraft noise and sonic booms on various animal species is necessary to assess potential impacts to wildlife populations from proposed military flight operations. Thus, in a joint U.S. Air Force/U.S. Fish and Wildlife Service effort, the National Ecology Research Center conducted a literature search of information pertaining to animal hearing and the effects of aircraft noise and sonic booms on domestic animals and wildlife. Information concerning other types of noise was also gathered to supplement the lack of knowledge on the effects of aircraft noise. The literature is summarized in the report to provide an overview of current knowledge. No attempt was made to evaluate the appropriateness or adequacy or the scientific approach of each study. A brief overview of the physics of sound and aircraft noise and sonic boom characteristics also is included to familiarize the reader with the terminology and concepts of aircraft noise and sonic boom impact analysis. (Bibliographic abstracts are available in a separate document). Author

N89-22299# Fish and Wildlife Service, Fort Collins, CO. National Ecology Research Center.

EFFECTS OF AIRCRAFT NOISE AND SONIC BOOMS ON DOMESTIC ANIMALS AND WILDLIFE: BIBLIOGRAPHIC ABSTRACTS

DOUGLAS N. GLADWIN, KAREN M. MANCI, and RITA VILLELLA (Fish and Wildlife Service, Kearneysville, WV.) Jun. 1988 84 p Sponsored by Air Force Engineering and Services Center, Tyndall AFB, FL (PB89-115034; NERC-88/32; AFESC-TR-88-14) Avail: NTIS HC A05/MF A01 CSCL 06C

The purpose is to provide an information base on the effects of aircraft noise and sonic booms on various animal species. Such information is necessary to assess potential impacts to wildlife populations from proposed military and other flight operations. To develop the document the National Ecology Research Center conducted a literature search of information pertaining to animal hearing and the effects of aircraft noise and sonic booms on domestic animals and wildlife. Information concerning other types of noise was also gathered to supplement the lack of knowledge on the effects of aircraft noise. The bibliographic abstracts in the report provide a compilation of current knowledge. No attempt was made to evaluate the appropriateness or adequacy of the scientific approach of each study. (A literature synthesis is available in a separate document). Author

N89-22300# Human Engineering Labs., Aberdeen Proving Ground, MD.

ANIMAL MODELS IN IMPULSE NOISE RESEARCH

G. RICHARD PRICE Dec. 1988 18 p

(Contract DA PROJ. 1L1-61102-B-7)
(AD-A204518; HEL-TN-9-88) Avail: NTIS HC A03/MF A01
CSCL 06/14

The growing concern for animal rights has made it incumbent upon the scientist to justify the use of animal models in research. This report focuses on research on hearing hazard from impulse noise and develops arguments for the use of animal models based on ethical, practical, and theoretical/experimental considerations. A variety of issues require the use of animal ears in research with intense impulse noises. Two of them are especially compelling. First, because we now know that sudden and unpredictable permanent damage can occur with intense impulsive sounds, they represent a hazard to which human ears should not be exposed, especially in an experimental setting. Second, the experiments that are most likely to provide critical theoretical information are hazardous, invasive, and/or require sacrifice of the ear in their execution. If human ears cannot be used and animal models are the only way to acquire the critical data or to validate mathematical models, then animal models must play a central role in advancing our scientific understanding and promoting the public interest in accurate rating and control of noise hazard. GRA

N89-22301# Boston Univ., MA. School of Medicine.
**HEAT EXHAUSTION IN A RAT MODEL: LITHIUM AS A
BIOCHEMICAL PROBE Report, 15 Jan. - 15 Oct. 1988**
STEVEN H. ZEISEL 8 Nov. 1988 18 p
(Contract DAMD17-88-C-8055; DA PROJ. 3E1-62777-A-879)
(AD-A204894) Avail: NTIS HC A03/MF A01 CSCL 06/10

Experimental methods have been developed and validated which will permit us to: (1) measure leakage of tissue enzymes (ALT, CPK, Alkaline phosphatase, LDH) during heat exposure in rats; (2) measure lithium concentrations in plasma using atomic absorption spectrophotometry; (3) measure total body water, extracellular fluid space, and intravascular fluid space in rats; and (4) passively heat restrained rats and record changes in rectal temperature. Our objectives for future work include: (1) learn methods for study of unrestrained rats which are passively heated; (2) learn methods for study of rats actively heated using treadmill; and (3) treat rats with lithium and determine whether passive restrained, unrestrained restrained, or actively heated lithium-treated rats can be differentiated from controls in terms of heating rate, tissue enzyme leakage, or body water distribution. GRA

N89-22302# Arizona State Univ., Tempe. Dept. of Chemistry.
**PARTICULATE MODELS OF PHOTOSYNTHESIS Technical
Progress Report, 1 Sep. 1986 - 28 Feb. 1989**
G. R. SEELY Feb. 1988 29 p
(Contract DE-FG02-86ER-13620)
(DE89-007961; DOE/ER-13620/T1) Avail: NTIS HC A03/MF
A01

The objective of the research is to develop photochemical energy conversion model systems based on chlorophyll adsorbed to particles of polyethylene swollen with tetradecane. A number of amphiphiles derived from histamine have been synthesized and tested with chlorophyll on polyethylene particles. They presumably ligate chlorophyll with the imidazole group, and some are capable of accepting electrons from the singlet excited state of the pigment. During the past year, the ability of chlorophyll to interact with cationic inverted micelles of dodecylpyridium iodide in toluene has been established, primarily by NMR chemical shift measurements. A presumption that a similar association exists within polyethylene-tetradecane particles has been supported, though mainly by indirect means. There is increased interest in nitroaromatic disulfides as potentially reversible oxidants for chlorophyll in the particulate system. One of them, 2,2'-dithiobis (5-nitropyridine), reacts with chlorophyll photochemically to form derivatives with reduced fluorescence, which appear to be covalently-linked donor-acceptor complexes. Experimental procedures have been tested for correcting fluorescence spectra and estimating quantum yields in highly scattering media, with the xanthene dye, 2',7'-dichlorofluorescein, in TiO sub 2 suspensions. DOE

N89-23060# Office of Technology Assessment, Washington, DC.

**NEW DEVELOPMENTS IN BIOTECHNOLOGY: US
INVESTMENT IN BIOTECHNOLOGY, PART 4**

Jul. 1988 300 p
(PB88-246939; OTA-BA-360-PT-4; LC-88-600538) Avail: NTIS
HC A13/MF A01; also available SOD HC \$7.50 as
052-003-01060-7 CSCL 06/3

The levels and types of investment currently are described being made by the Federal, State, and private sectors. Issues that affect investment: levels of R and D funding, research priorities, interagency coordination, information requirements, training and education needs, monitoring of university industry research, State efforts to promote biotechnology, the effects of tax law on commercial biotechnology, the adequacy of Federal assistance for biotechnology start-ups, and the effects of export control on biotechnology commerce are identified. Author

N89-23061*# National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, CA.
ACCLIMATIZATION TO COLD IN HUMANS
HANNA KACIUBA-USCILKO (Polish Academy of Sciences,
Warsaw) and JOHN E. GREENLEAF Apr. 1989 43 p
(NASA-TM-101012; A-88223; NAS 1.15:101012) Avail: NTIS HC
A03/MF A01 CSCL 06/19

This review focuses on the responses and mechanisms of both natural and artificial acclimatization to a cold environment in mammals, with specific reference to human beings. The purpose is to provide basic information for designers of thermal protection systems for astronauts during intra- and extravehicular activities. Hibernation, heat production, heat loss, vascular responses, body insulation, shivering thermogenesis, water immersion, exercise responses, and clinical symptoms and hypothermia in the elderly are discussed. Author

N89-23062# Pacific Northwest Labs., Richland, WA.
**INHALATION DEVELOPMENTAL TOXICOLOGY STUDIES:
TERATOLOGY STUDY OF METHYL ETHYL KETONE IN MICE
Final Report**
TERRYL J. MAST, J. A. DILL, J. J. EVANOFF, R. L. ROMMEREIM,
RICHARD J. WEIGEL, and R. BRUCE WESTERBERG Feb.
1989 246 p
(Contract DE-AC06-76RL-01830)
(DE89-009563; PNL-6833; NTH-Y01-ES-70153) Avail: NTIS HC
A11/MF A01

Methyl Ethyl Ketone (MEK) is a widely used industrial solvent which results in considerable human exposure. In order to assess the potential for MEK to cause developmental toxicity in rodents, four groups of Swiss (CD-1) mice were exposed to 0, 400, 1000 or 3000 ppm MEK vapors, 7 h/day, 7 dy/wk. Ten virgin females and approx.30 plug-positive females per group were exposed concurrently for 10 consecutive days (6--15 dg for mated mice). Body weights were obtained throughout the study period, and uterine and fetal body weights were obtained at sacrifice on 18 dg. Uterine implants were enumerated and their status recorded. Live fetuses were sexed and examined for gross, visceral, skeletal, and soft-tissue craniofacial defects. Exposure of pregnant mice to these concentrations of MEK did not result in apparent maternal toxicity, although there was a slight, treatment-correlated increase in liver to body weight ratios which was significant for the 3000-ppm group. Mild developmental toxicity was evident at 3000-ppm as a reduction in mean fetal body weight. This reduction was statistically significant for the males only, although the relative decrease in mean fetal body weight was the same for both sexes. DOE

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A89-36112**CREW WORKLOAD IN JASDF C-1 TRANSPORT FLIGHT. II - CHANGE IN URINARY CATHECHOLAMINE EXCRETION**

AKIO NAKAMURA, YUKIKO KAKIMOTO, FUMIKO TAJIMA, HIDEO TARUI, and SHIGEYUKI YAGURA (Japan Air Self Defense Force, Aeromedical Laboratory, Tokyo, Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, April 1989, p. 301-306. refs

Serial changes in urinary catecholamine excretion were determined for 17 cockpit crews (6 captains, 6 copilots and 5 flight engineers) of JASDF C-1 aircraft during 10-hour (h) scheduled flights, in which captains and copilots performed almost the same flight tasks. The norepinephrine/epinephrine ratio (N/E) in copilots decreased significantly during the flight, whereas little decrease of the N/E was found in captains. Flight engineers showed an intermediate N/E value between captains and copilots. Hormonal responses appeared to correlate with differences in the amount of flying experience of crewmembers. Differences between captains and copilots were more significant when handling the aircraft. Results suggested that flight stresses perceived by crewmembers in the same cockpit were influenced by their flying experience and flight position which could be clearly assessed by determining relative excretions of epinephrine and norepinephrine. Author

A89-36115**OCULAR REFRACTION WITH BODY ORIENTATION**

J. V. LOVASIK and A. C. KOTHE (Waterloo, University, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, April 1989, p. 321-328. refs
(Contract NSERC-A-0057)

Body inversion is used experimentally to raise the intraocular pressure (IOP). Psychophysical and electrophysiological methods of assessing visual function in artificially raised IOP are generally influenced by the clarity of the retinal image. It is therefore essential to be aware of any changes in ocular refraction induced by changes in body orientation. The present study reports on the refractive changes occurring with body orientation in conditions where accommodation is freely responding, and also immobilized pharmacologically. Ocular refraction varies by less than 0.50D across all body orientations as measured by a laser optometer which provides refractive measurements independent of the perception of blur. These results indicate that pattern-dependent tests of visual function are not likely to be influenced by refractive changes on body inversion. Author

A89-36118**HYPERCHOLESTEROLEMIA IN THE AVIATOR**

RAYMOND P. STEINHAUSER and JOHN C. STEWART (USAF, Hospital Altus, Altus AFB, OK) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, April 1989, p. 336-341. refs

The prevalence of hypercholesterolemia in flight personnel was examined together with the current guidelines of the USAF Coronary Artery Risk Evaluation program and the National Institute of Health recommendations. Medical records of the four active duty flying squadrons at Altus AFB, OK, were reviewed to establish the instances of hypercholesterolemia in the 501 crewmembers, and its relationship with age. It was found that, of flyers over 30 years of age, 52 percent had low-density lipoprotein cholesterol in the borderline high risk or high risk group. No flier was taking cholesterol medication or was grounded by his cholesterol level. I.S.

A89-36353#**SYMPTOMS AND SIGNS ASSOCIATED WITH ANTI-G TRAINING**

FUKUMI NOZAWA, AKIO NAKAMURA, TADAO YANAKA, TOYOFUMI KAKU, WATARU MITSUHASHI et al. Japan Air Self Defense Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 29, June 1988, p. 77-83. In Japanese, with abstract in English. refs

The symptoms displayed by three groups in anti-G training are examined. The symptoms include autonomic imbalance due to motion sickness and spatial disorientation and visual symptoms due to high-G hydrostatic stress. The severity of symptoms among groups in different types of training are compared. The frequency of symptoms which occur at each phase of training is discussed. The types of training considered include basic course pattern, gradual and rapid onset rate, and simulated air combat maneuver training for F-15 pilots. R.B.

A89-37520**THE STABILITY OF FREQUENCY-SPECIFIC EEG RESPONSES CAUSED BY SENSORY STIMULATION IN THE BRAIN HEMISPHERES [STABIL'NOST' PROIAVLENNII V POLUSHARIIAKH GOLOVNOGO MOZGA CHASTOTNO-SPETSIFICHNYKH REAKTSII EEG, VYZVAEMYKH SENSORNOI STIMULIATSIEI]**

V. F. KONOVALOV, A. T. BONDAR', and A. I. FEDOTCHEV (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 305, no. 2, 1989, p. 503-507. In Russian. refs

A89-37672* Texas Univ., Houston.

VENOUS GAS EMBOLISM - TIME COURSE OF RESIDUAL PULMONARY INTRAVASCULAR BUBBLES

B. D. BUTLER, S. LUEHR, and J. KATZ (Texas, University, Houston) Undersea Biomedical Research (ISSN 0093-5387), vol. 16, no. 1, 1989, p. 21-29. refs
(Contract NAG9-215)

A study was carried out to determine the time course of residual pulmonary intravascular bubbles after embolization with known amounts of venous air, using an N₂O challenge technique. Attention was also given to the length of time that the venous gas emboli remained as discrete bubbles in the lungs with 100 percent oxygen ventilation. The data indicate that venous gas emboli can remain in the pulmonary vasculature as discrete bubbles for periods lasting up to 43 + or - 10.8 min in dogs ventilated with oxygen and nitrogen. With 100 percent oxygen ventilation, these values are reduced significantly to 19 + or - 2.5 min. K.K.

A89-38347**EYE MOVEMENT RESPONSES DURING LINEAR ACCELERATION**

MOTOYUKI HASHIBA, SATORU WATANABE, AKIRA TAKA-BAYASHI, MASAFUMI TANAKA, SADAHARU TAKAGI (Nagoya University, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2319-2324. refs

The vestibulo-oculomotor reflex induced by linear acceleration is used to study the characteristics of the gravity sensory organ. A sled is used to generate linear acceleration and the otolith-oculomotor response is studied by changing the direction of acceleration to a variety of the subject's postures. It was found that eye movements with a nystagmic pattern were elicited by linear acceleration. Horizontal eye movements were produced by right-left acceleration and vertical eye movements were produced by head-foot acceleration. K.K.

A89-38588* Pennsylvania State Univ., University Park.

MOTION SICKNESS AND GASTRIC MYOELECTRIC ACTIVITY AS A FUNCTION OF SPEED OF ROTATION OF A CIRCULAR VECTION DRUM

SENQI HU, ROBERT M. STERN, MICHAEL W. VASEY, and KENNETH L. KOCH (Pennsylvania State University, University Park and Hershey) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 411-414. refs
(Contract NAG9-118)

Motion sickness symptoms and electrogastrograms (EGGs) were obtained from 60 healthy subjects while they viewed an optokinetic drum rotated at one of four speeds: 15, 30, 60 or 90 deg/s. All subjects experienced vection, illusory self-motion. Motion sickness symptoms increased as drums speed increased up to 60 deg/s. Power, spectral intensity, of the EGG at the tachygaltria frequencies (4-9 cpm) was calculated at each drum rotation speed. The correlation between the motion sickness symptoms and the power at 4-9 cpm was significant. Thus, drum rotation speed influenced the spectral power of the EGG at 4-9 cpm, tachygaltria, and the intensity of motion sickness symptoms. Author

A89-38589

HUMAN TOLERANCE TO 100 PERCENT OXYGEN AT 9.5 PSIA DURING FIVE DAILY SIMULATED 8-HOUR EVA EXPOSURES
JAMES T. WEBB, ROBERT M. OLSON, ROBERT W. KRUTZ, JR., GENE DIXON, and PAUL T. BARNICOTT (Krug International Corp., San Antonio; USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 415-421. refs (Contract F33615-85-C-4503)

Twenty-one subjects were exposed to 100 percent oxygen at 9.5 psia for 5 consecutive days, 8 h/d while performing moderate exercise to simulate a typical work-week in the proposed pressure suit environment. No decompression sickness or venous gas bubbles were detected. Pulmonary function tests, physical exams, blood analyses, arterial oxygen saturation monitoring, and X-rays showed no evidence of oxygen toxicity under these conditions. These results suggest that a 100 percent oxygen, 9.5 psia pressure suit environment could avoid both decompression sickness and oxygen toxicity during EVAs of comparable duration and physical activity. Author

A89-38590

INTERACTIVE EFFECTS OF HEAT, PHYSICAL WORK, AND CO EXPOSURE ON METABOLISM AND COGNITIVE TASK PERFORMANCE

DAVID E. BUNNELL and STEVEN M. HORVATH (California, University, Santa Barbara) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 428-432. Research supported by the Chestnut Funds. refs (Contract EPA-R-811596)

The effects of exercise and heat on the cognitive performance of humans were evaluated both with and without CO exposure in 16 male subjects at rest or performing one of two levels (35 or 60 percent maximum) of treadmill exercise in two hot environments (30 C at high rh and 41 C at low rh). The results showed that the carboxyhemoglobin (COHb) levels of up to 10 percent, with or without accompanying physical work in a hot environment, had no effect on the results of short-term memory scanning, spatial processing, arithmetic abilities, psychomotor tracking, or color-word interference tests of subjects. Heat exposure per se had no significant effect, while elevated COHb was associated with greater reporting of exertion and eye, ear, nose, and throat symptoms during heavy exercise concomitant with greater minute ventilation and heart rate. I.S.

A89-38591* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

EVALUATION OF THE NASA/JSC HEALTH RELATED FITNESS PROGRAM

LARRY T. WIER, A. S. JACKSON, and MARY B. PINKERTON (NASA, Johnson Space Center, Houston; Houston, University, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 438-444. refs

The effects of the NASA Health Related Fitness Program (HRFP), which includes a 12-week educational component (EC) and quarterly fitness retests (RT), on the results of periodic testing of fitness, body composition, and blood lipids were evaluated in three groups of pilots. These included the group of compliers (those who completed EC and not less than 75 percent RT), the noncompliers (completed EC and less than 75 percent RT), and the dropouts from EC. Results show that beneficial changes in

physical activity found two years after the completion of the HRFP were related to both the completion of the EC and the periodic fitness reevaluations. These changes were associated with maximal oxygen consumption, percent body fat, body weight, and blood lipids. I.S.

A89-38592

NON-EJECTION CERVICAL SPINE INJURIES DUE TO +GZ IN HIGH PERFORMANCE AIRCRAFT

DAVID G. SCHALL (Nebraska, University, Medical Center, Omaha) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 445-456. refs

Eight cervical spine injury cases, due to or aggravated by +Gz in F-15 and F-16 aircrew members are reviewed. These include two compression fractures, three left cases of herniated nucleus pulposus, one fracture of the spinous process, one interspinous ligament tear, and one myofascial syndrome. Mechanisms of injury and evaluation are discussed. Author

A89-38593

PILOTS WITH NON-INSULIN-DEPENDENT DIABETES MELLITUS CAN SELF-MONITOR THEIR BLOOD GLUCOSE

NAOKO TAJIMA, CHIYOE YAMADA, ICHIRO ASUKATA, KANHACHIRO YAMAMOTO, MASAOMI HOKARI (Japan Air Lines, Tokyo) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 457-459. refs

A89-38678

RATE OF ERYTHROPOIETIN FORMATION IN HUMANS IN RESPONSE TO ACUTE HYPOBARIC HYPOXIA

KAI-UWE ECKARDT, URS BOUTELLIER, ARMIN KURTZ, MICHAEL SCHOPEN, ERWIN A. KOLLER (Zuerich, Universitaet, Zurich, Switzerland) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 66, April 1989, p. 1785-1788. Research supported by Hartmann Mueller Stiftung fuer Medizinische Forschung. refs (Contract SNSF-3,023,084)

This study was carried out to investigate the early changes in erythropoietin (EPO) formation in humans in response to hypoxia. Six volunteers were exposed to simulated altitudes of 3,000 and 4,000 m in a decompression chamber for 5.5 h. EPO was measured by radioimmunoassay in serum samples withdrawn every 30 min during altitude exposure and also in two subjects after termination of hypoxia (4,000 m). EPO levels during hypoxia were significantly elevated after 114 and 84 min (3,000 and 4,000 m), rising thereafter continuously for the period investigated. After termination of hypoxia, EPO levels continued to rise for about 1.5 h and after 3 h declined exponentially with an average half-life time of 5.2 h. Author

A89-38794

RECORDING AND INTERPRETATION OF CEREBRAL MAGNETIC FIELDS

RIITTA HARI and OLLI V. LOUNASMAA (Helsinki University of Technology, Espoo, Finland) Science (ISSN 0036-8075), vol. 244, April 28, 1989, p. 432-436. Research supported by the Academy of Finland. refs

An account is given of laboratory results obtained to date for the noninvasive cerebral activity study method of magnetoencephalography (MEG), which reflects the cortical activity of neuronal populations at the level of cytoarchitectonic areas intermediate between the single-neuron microlevel and the macrolevel of complex cerebral functions. By investigating the spatiotemporal course of MEG recordings, it should be possible to study several aspects of brain signal processing. While multichannel MEG systems are currently expensive (of the order of \$1-2 million/unit), it is anticipated that developments in SQUID technology, magnetic shielding, electronics, and computers, will lower MEG procurement costs in the future. O.C.

A89-39178

EVALUATION OF THE EFFECT OF VIBRATION ON PILOTS [OCENA WPLYWU WIBRACJI NA USTROJ PILOTA]

BRONISLAW TURSKI, LECH MARKIEWICZ, and WOJCIECH

DEBINSKI (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) *Postepy Astronautyki* (ISSN 0373-5982), vol. 21, no. 3-4, 1988, p. 39-54. In Polish. refs

Examinations were performed on flight personnel to study possible adverse effects of vibration. As far as the peripheral circulatory system and skeletal system are concerned, no specific changes were detected. The lowering of sensory conduction rate in peripheral nerves was found in older pilots with high exposure level of vibrations, accompanied by a statistically significant increase of several lipid indexes. Author

A89-39476#

THE CHARACTERISTICS OF PHYSIOLOGICAL RESPONSES AND TOLERANCE EVALUATION OF PRESSURE BREATHING
JINGSHAN CHEN, BAOLAN ZHANG, and SIGUANG JIA (Institute of Aerospace Medico-Engineering, Beijing, People's Republic of China) *Acta Aeronautica et Astronautica Sinica* (ISSN 1000-6893), vol. 10, Feb. 1989, p. B59-B65. In Chinese, with abstract in English. refs

Experiments were performed on six young healthy males during pressure breathing without trunk counterpressure. The values of intrapulmonary pressure were 0, 2.0, 3.0, 3.4, 4.0, 4.4, and 5.4 kPa. With increasing pressure within the lung, the compensatory function of circulatory and respiratory systems were gradually strengthened and the respiratory power consumption index increased at first, then dropped as the intrapulmonary pressure reached 4.0 kPa. The decrease in these physiological indices indicated a physiological endurance limit during pressure breathing. The respiratory power consumption index reflects respirodynamical physiological characteristics of the subjective sensation during pressure breathing and may be used as a coindicator to evaluate tolerance. A method for comprehensively evaluating the tolerance is experimentally presented. C.D.

A89-39751

METHODS FOR ASSESSING THE PSYCHOPHYSIOLOGICAL RESERVES OF A PILOT [METODIKA OTSENKI PSIKHOFIZIOLOGICHESKIKH REZERVOV LETCHIKA]
A. V. SHAKULA and A. D. KLIUNK *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Feb. 1989, p. 46-49. In Russian.

A complex of diagnostic methods for assessing the psychophysiological reserves of a pilot is described, which is based on cardiovascular-system parameters and changes in these parameters effected by a bicycle ergometer test. The bicycle ergometer test includes simple and complex sensomotor problems superimposed on physical loads. It was found that the psychophysiological reserves could be significantly increased by an electrotranquillizer. I.S.

A89-39752

GIVE MORE ATTENTION TO A HEALTHY LIFESTYLE OF FLIGHT PERSONNEL [BOL'SHE VNIMANIYA ZDOROVOMU OBRAZU ZHIZNI LETNOGO SOSTAVA]
N. I. FROLOV and I. V. SHMELEV *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Feb. 1989, p. 55-57. In Russian.

The effects of continuously increasing the levels of psychic and physical loads on the flight personnel of modern aircraft on the well-being of the personnel are discussed together with the lifestyle factors that would improve the well-being and work capacity of flight personnel. It is emphasized that such factors as the upgrading of the aviator's technical education, the ecological conditions to which the aviators are exposed, and social factors such as an increase of psychic and informational loads are of utmost importance to the well-being of an aviator. Consideration is given to the effects of automation on the muscular and cardiovascular systems and to the importance of physical exercise for the maintenance of these systems. Particular attention is given to factors responsible for the development of cardiac ischemia. I.S.

A89-39757

CEREBRAL CIRCULATION DURING INTENSE MENTAL WORK [KROVOOBRAZHCENIE GOLOVNOGO MOZGA PRI NAPRIAZHENNOI UMSTVENNOI RABOTE]

B. M. FEDOROV, T. V. SEBEKINA, E. N. STREL'TSOVA, V. M. VAKULENKO, T. M. SINITSYNA et al. *Fiziologija Cheloveka* (ISSN 0131-1646), vol. 15, Mar.-Apr. 1989, p. 48-55. In Russian. refs

The effect of intense mental work on the cerebral circulation was investigated in subjects with high levels of intellectual capability and motivation, who were fitted with scalp electrodes placed over various cortical regions. The parameters of systemic and regional circulation were measured during the process of solving complex arithmetic and linguistic problems under conditions of limited time and intervals. It was found that changes in cerebral circulation during intensive mental work were caused by a redistribution of blood flow in various cerebral structures. In particular, during intensive mental work under stressful conditions, there was an increase of blood flow in the region including the supramarginal convolution in the superior frontal gyrus, in the region of the Brock's zone, and in the superior temporal gyrus of left hemisphere. In other regions, it was found that an increase in the blood flow could be followed by a decrease and vice versa. I.S.

A89-39758

RESISTANCE TO STATIC LOADS AND THE H-REFLEX [N-REFLEKS I USTOICHIVOST' K STATICHESKIM NAGRUZKAM]

G. L. BERCHANSKII, S. V. KAZNACHEEV, and S. V. UDALOVA (AMN SSSR, Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) *Fiziologija Cheloveka* (ISSN 0131-1646), vol. 15, Mar.-Apr. 1989, p. 105-107. In Russian. refs

The relative values of the H-reflex of m. gastrocnemius and m. soleus were correlated with the relative measures of the endurance of a hand to static loads. It was found that the correlation between these two parameters was linear. The correlation was higher for the right hand than for the left, and higher for m. soleus than for m. gastrocnemius. I.S.

N89-22303# Joint Publications Research Service, Arlington, VA. **JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES**

13 Jul. 1988 42 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-88-013) Avail: NTIS HC A03/MF A01

Topics addressed include: aerospace medicine, agriculture, biochemistry, biophysics, veterinary medicine, radiation biology, human factors engineering, virology, immunology, laser applications, microbiology, biotechnology, and pharmacology.

N89-22304# Joint Publications Research Service, Arlington, VA. **EFFECT OF VARIOUS EXERCISE REGIMENS FOR INCREASED ANTIORTHOSTATIC RESISTANCE Abstract Only**

YU. N. VAVAKIN, I. P. ZHEKOV, and A. F. ZAVADOVSKIY *In its JPRS Report: Science and Technology. USSR: Life Sciences* p 1 13 Jul. 1988 Transl. into ENGLISH from *Teoriya i Praktika Fizicheskoy Kultury, Moscow (USSR)*, no. 3, Mar. 1988 p 20-22

Avail: NTIS HC A03/MF A01

Two methods of special physical exercise designed to increase the resistance of the body to blood redistribution towards the upper segments of the body were evaluated. Twelve apparently healthy men were training 2 hours every day, 3 times a week using several types of head stands; one half of the study group did this continuously, one half with discrete breaks. Before and after the experiment the latent period of simple sensorimotor reaction to light stimulation was determined. It was shown that both methods gave a practical identical increase in resistance to blood redistribution. Thus, it is important to evenly distribute such special activity through the training period. Such exercises do not decrease physical or static endurance. They should be used in physical preparation of astronauts, pilots, and other professionals exposed to blood redistribution toward the upper torso. Author

N89-22307*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

THE EFFECTS OF DIFFERENT RATES OF ASCENT ON THE INCIDENCE OF ALTITUDE DECOMPRESSION SICKNESS

K. V. KUMAR (National Research Council, Haifa, Israel) and JAMES M. WALIGORA Mar. 1989 67 p
(NASA-TM-100472; S-589; NAS 1.15:100472) Avail: NTIS HC A04/MF A01 CSCL 06/19

The effect of different rates of ascent on the incidence of altitude decompression sickness (DCS) was analyzed by a retrospective study on 14,123 man-flights involving direct ascent up to 38,000 ft altitude. The data were classified on the basis of altitude attained, denitrogenation at ground level, duration of stay at altitude, rest or exercise while at altitude, frequency of exercise at altitude, and ascent rates. This database was further divided on the basis of ascent rates into different groups from 1000 ft/min up to 53,000 ft/min. The database was analyzed using multiple correlation and regression methods, and the results of the analysis reveal that ascent rates influence the incidence of DCS in combination with the various factors mentioned above. Rate of ascent was not a significant predictor of DCS and showed a low, but significant multiple correlation ($R=0.31$) with the above factors. Further, the effects of rates below 2500 ft/min are significantly different from that of rates above 2500 ft/min on the incidence of symptoms ($P=0.03$) and forced descent ($P=0.01$). At rates above 2500 ft/min and up to 53,000 ft/min, the effects of ascent rates are not significantly different (P greater than 0.05) in the population examined while the effects of rates below 2500 ft/min are not clear. Author

N89-22308# Human Engineering Labs., Aberdeen Proving Ground, MD.

STABILITY OF EVOKED POTENTIALS DURING AUDITORY ATTENTION Final Report

LYNN C. OATMAN Dec. 1988 15 p
(AD-A204031; HEL-TM-10-88) Avail: NTIS HC A03/MF A01 CSCL 05/8

Click-evoked potentials were recorded from the round window (cochlear microphonic and auditory nerve), cochlear nucleus, and auditory cortex of unanesthetized cats during periods of auditory attention and nonattention. The clicks (irrelevant stimuli) of increasing intensity were presented continuously as background before, during, and after the presentation of a warning stimulus (S1) followed by an imperative (relevant) stimulus (S2) to which the cats made a behavioral response. At all electrode sites, when the cats were attentive to S2, the mean amplitudes of background irrelevant click-evoked potentials within the S1-S2 interval were not significantly different from those of the pretest and posttest control sessions. During auditory attention, no evidence was obtained for peripheral gating at the auditory nerve by the olivocochlear bundle. The dissociation observed between the amplitudes of background irrelevant click-evoked potentials and behavioral performance may reflect overlearning of the S1-S2 response task. GRA

N89-22309# Naval Aerospace Medical Research Lab., Pensacola, FL.

MAPPING THE EVENT RELATED POTENTIALS OF THE BRAIN: THEORETICAL ISSUES, TECHNICAL CONSIDERATIONS AND COMPUTER PROGRAMS Final Report

R. R. STANNY 20 Oct. 1988 26 p
(AD-A204120; NAMRL-SR-88-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

Event-related potentials (ERPs) are the summed membrane potentials of large numbers of simultaneously active neurons. To determine the anatomical location of the population of cells that produces a specific ERP, one must first record its responses from a number of points to characterize the spatial distribution of its surface field. A number of factors affect the validity of spatial analyses of ERP phenomena. These include the number of recording electrodes used, the choice of the reference electrode, any distortions introduced when preprocessing the EEG, and any distortions introduced by the mapping process itself. This report

discusses a variety of methods that have been used to generate spatial representations of the electroencephalogram. It deals with pertinent aspects of the recording process, as well as with the spatial analysis per se. Some limitations of the various approaches are described, and a general plan of implementation adaptable to most situations is outlined. The Appendix contains two computer programs that can be used to generate surface-distribution maps of ERPs. GRA

N89-22310# Purdue Univ., West Lafayette, IN. Dept. of Psychological Sciences.

AUDITORY PATTERN MEMORY: MECHANISMS OF TONAL SEQUENCE DISCRIMINATION BY HUMAN OBSERVERS Final Technical Report, 1 Sep. 1987 - 31 Aug. 1988

ROBERT D. SORKIN 30 Oct. 1988 28 p
(Contract AF-AFOSR-0349-87; AF PROJ. 2313)
(AD-A204250; AFOSR-89-0047TR) Avail: NTIS HC A03/MF A01 CSCL 05/8

A two-process model of pattern discrimination was developed to describe how tonal sequences are processed, stored, and discriminated by human observers. The model was evaluated in tasks in which observers were required to discriminate between the spectral or temporal patterns encoded in two sequences of tones. The experimental results supported the assumptions of a trace/context coding theory. The trace mechanism is relatively insensitive to temporal transformations made to frequency-coded patterns but relatively sensitive to temporal transformations made to temporally coded patterns. The effects of intervening maskers on the trace were also evaluated. GRA

N89-22311# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

THE ROLE OF THE MOISTURE/VAPOUR BARRIER IN THE RETENTION OF METABOLIC HEAT DURING FIRE FIGHTING

JOHN FRIM and TIIT T. ROMET Oct. 1988 86 p
(AD-A204304; AD-E801786; DCIEM-88-RR-40) Avail: NTIS HC A05/MF A01 CSCL 06/10

The relationship between metabolic heat build-up and the vapor permeability of the barrier layer in fire turnout clothing was examined under a variety of conditions. Laboratory exercise tasks were used to simulate the work of fire fighters performing under three different environmental conditions, cold, hot and extended very hot conditions. The laboratory studies were followed by a field trial in which true fire fighting activities were performed. The clothing elements examined included three outer shells, five moisture/vapor barrier configurations, and two thermal liners. Ten parameters indicative of thermal physiological strain were monitored in eight professional fire fighters to assess the role of the barrier in the retention of metabolic heat. The results showed that the moisture/vapor barrier material/configuration was the dominant factor in determining thermal physiological strain, with the shell and liner playing very minor roles. Differences in strain as a function of barrier were discernible even under low to moderate stress, but became more pronounced with higher ambient temperatures and longer work periods. It is concluded that a full vapor barrier of a material such as neoprene leads to significantly higher thermal physiological strain than a vapor permeable water barrier of a material such as GORE-TEX. GRA

N89-22312# School of Aerospace Medicine, Brooks AFB, TX. Human Systems Div.

PHYSICAL FITNESS TO ENHANCE AIRCREW G TOLERANCE Final Report, 1 Jan. 1986 - 30 Jun. 1988

RONALD P. CRISMAN and RUSSELL R. BURTON Mar. 1988 60 p
(AD-A204689; USAFSAM-SR-88-1; NAMRL-1334) Avail: NTIS HC A04/MF A01 CSCL 06/10

A physical fitness program of resistance training, such as weight lifting, directed toward increasing strength and anaerobic capacity will increase G-duration tolerance. This tolerance increase is particularly useful for USAF/USN pilots flying high-performance fighters during aerial combat maneuvers. A weight-training program including exercise equipment to be used by aviators to increase

(and maintain this increase) their strength and anaerobic capacity is described. Aerobics conditioning with precautions and limitations for G tolerance is discussed. Figures show recommended weight-training exercises. GRA

N89-22313# California Univ., Los Angeles.
NOVEL APPROACHES TO THE STUDY OF SYNAPTIC FUNCTION Final Report, May 1985 - Oct. 1988

CAMERON B. GUNDERSEN 16 Jan. 1989 3 p
 (Contract DAAG29-85-K-0113)
 (AD-A204842; ARO-21940.3-LS) Avail: NTIS HC A02/MF A01
 CSDL 06/2

The original goal of the proposed experiments was to explore the possibility that mRNA-injected *Xenopus* oocytes could be used to reconstitute the transmitter release process. The hypothesis was that it might be possible to detect physiologically relevant acetylcholine release from *Xenopus* oocytes injected first with mRNA from cholinergic neurons and then with synaptic vesicles. For a number of technical reasons that have been discussed in prior reports, this approach has not been successful. In lieu of this effort, our primary focus has shifted toward attempts to clone the cDNA for two presynaptic proteins (the N-type calcium channel and the high affinity choline transporter) and one post-synaptic protein (a glutamate receptor). The status of these efforts is outlined in this report. GRA

N89-22314# California Univ., Berkeley. Dept. of
 Physiology-Anatomy.

INVESTIGATION OF DYNAMIC ALGORITHM FOR PATTERN RECOGNITION IN CEREBRAL CORTEX Final Report, 1 Sep. 1987 - 31 Aug. 1988

WALTER J. FREEMAN 1989 16 p
 (Contract AF-AFOSR-0317-87)
 (AD-A204843; AFOSR-89-0088TR) Avail: NTIS HC A03/MF A01
 CSDL 06/4

The goal of this work is to characterize mathematically the essential mechanisms and principles of operation of the mammalian olfactory neural network and evaluate its computation and pattern recognition capabilities. The intent is to explicate novel design principles that may underly the superior performance of biological systems in pattern recognition through detailed study of a particular system. This research will be for the purpose of establishing a theoretical framework for the evaluation of architectures and algorithms for parallel computation - with particular emphasis on neural networks. GRA

N89-23063# Severn Communications Corp., Millersville, MD.
ASTRONAUT RADIATION EXPOSURE IN LOW-EARTH ORBIT. PART 1: GALACTIC COSMIC RADIATION

JOHN R. LETAW 31 Mar. 1988 45 p
 (Contract N00014-87-C-2251)
 (AD-A204598; SCC-88-01) Avail: NTIS HC A03/MF A01 CSDL
 06/7

In recent years, there has been increasing concern about the radiation doses which will be suffered by astronauts on present-day and future space missions. In order to characterize radiation exposure risks on space missions one requires models of space radiation environments, codes for transporting the components of ionizing radiation, and procedures for assessing radiation risks of a given exposure. To verify their accuracy, predictions based on these transport results must then be compared with existing dosimetry data. Linear energy transfer (LET) spectra, absorbed dose, and dose equivalent from galactic cosmic radiation and its fragments are presented for four, representative low-earth orbit configurations. The orbits include a high (STS-51J) and low (STS-61C) altitude, low-inclination (28.5 degs) flight; a high inclination (49.5 degs) flight (STS-51F); and a polar flight. Results are compared with computations for an exo-magnetospheric flight. GRA

N89-23064# Westinghouse Electric Corp., Cockeysville, MD.
 Product Support and Equipment Dept.

MOTOR THEORY OF AUDITORY PERCEPTION Final Report, 1 Sep. 1987 - 31 Aug. 1988

HEATHER WILLIAMS 2 Dec. 1988 53 p
 (Contract AF-AFOSR-0336-86; AF PROJ. 2313)
 (AD-A204951; AFOSR-89-0213TR) Avail: NTIS HC A04/MF A01
 CSDL 06/4

Behavioral paradigms have been developed that yield quantifiable, reliable results for testing the discriminability of two auditory stimuli (operant go-nogo) and individuals' preferences between two stimuli (two-speaker choice test). The copulation solicitation response is not reliable. Zebra finches can learn to produce and discriminate variants in the timbre of song syllables. Adult males learn a discrimination between two similar songs more quickly when one of those songs is their own. Auditory responses have been recorded, measured, and cataloged in all the forebrain nuclei with connections to the song motor system. The latencies may give indications of how this auditory information is processed. Deafening studies had led to the conclusion that vocal plasticity ceased at sexual maturity in closed-ended song learners. This is not so: when a hearing male's song is altered by cutting the vocal motor nerves, a limited form of plasticity in production is seen. GRA

N89-23065# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

A NEW PERSPECTIVE IN THE ETIOLOGY, TREATMENT, PREVENTION AND PREDICTION OF SPACE MOTION SICKNESS M.S. Thesis

ROGELIO MORALES, JR. Dec. 1988 169 p
 (AD-A205660; AFIT/GSO/ENG/88D-2) Avail: NTIS HC A08/MF
 A01 CSDL 06/15

Seven male subjects were given the drug phenytoin (dilatant) in double blind, placebo-controlled crossover experiment. Subjects were rotated in a motion stimulus chair while several of their physiological parameters were measured. Subjects treated with dilatant were found to have a greater tolerance to motion sickness than when they were treated with a placebo. Also, dilatant did not affect the physical performance and cognitive skills of the subjects. The research analyzed heart rate, respiration, gastro-intestinal activity, and brain wave activity. The research found an increase in mean heart rates, mean respiration intake volume, and electrospinalchogram root mean square voltages during motion sickness. Root mean square voltage of subdelta-delta (.05 to 1 Hz) electroencephalogram (EEG) activity increased in subjects that were least susceptible to motion sickness while subjects that were highly susceptible to motion sickness had insignificant subdelta-delta EEG activity. Motion sickness models were developed using the Barron Associates' Abductive Reasoning Mechanism (ARM) software. Motion sickness prediction models were developed using the ARM software and linear regression. GRA

N89-23066# Naval Health Research Center, San Diego, CA.
BENZODIAZEPINES AND CAFFEINE: EFFECT ON DAYTIME SLEEPINESS, PERFORMANCE, AND MOOD Interim Report

L. C. JOHNSON, C. L. SPINWEBER, and S. A. GOMEZ 21 Dec. 1988 31 p
 (AD-A205862; NHRC-88-51) Avail: NTIS HC A03/MF A01
 CSDL 06/15

In a double-blind parallel group design, 80 young adult males were divided into eight treatment groups. Subjects received 15 or 30 mg of flurazepam, 0.25 or 0.50 mg of triazolam, or placebo at bedtime, and 250 mg of caffeine or placebo in the morning for two treatment days. Two objective (MSLT and lapses) and two subjective (Stanford Sleepiness Scale and Visual Analog) measures of sleepiness, five performance tests, and two mood measures (Profile of Mood Scale and Visual Analog Scale) were administered repeatedly on both days. Significant treatment effects were found for sleepiness but not for performance or mood. Early morning caffeine significantly antagonized next day hypnotic induced drowsiness and enhanced alertness in the subjects who received

bed time placebo. Flurazepam, 30 mg, subjects were more sleepy than all other groups, but the flurazepam, 15 mg, group did not differ significantly from those receiving triazolam. Although not significantly different, the flurazepam, 30 mg, group had a poorer performance score and more negative mood than the other groups. Performance in this group was most improved by caffeine. In all groups, sleepiness was greatest and performance and mood poorest in early morning trials and caffeine was most effective at this time. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A89-36113
AN EVALUATION OF COGNITIVE-BEHAVIORAL THERAPY FOR TRAINING RESISTANCE TO VISUALLY-INDUCED MOTION SICKNESS

THOMAS G. DOBIE (U.S. Navy, Naval Biodynamics Laboratory, New Orleans, LA), JAMES G. MAY, WANDA D. FISHER, and NANCY B. BOLOGNA (New Orleans, University, LA) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 60, April 1989, p. 307-314. refs
 (Contract N00205-86-M-E474)

The value of cognitive counseling in a therapeutic technique for reducing visually induced motion sickness by a cognitive-behavioral training was evaluated. Subjects, assigned to one of four groups matched on the basis of their ability to tolerate visually-induced apparent motion (VM), received either desensitization only (the term selected to connote the decrease in sensitivity over time with repeated exposures), cognitive counseling therapy only (the DT and CT groups), or a combination of CT and DT (the CG group); the fourth group was not treated, serving as a control (C). The results showed that only subjects in the CT and GT groups exhibited significant increases in VM tolerance, when pretreatment measures were compared to posttreatment measures. I.S.

A89-36119
PASSENGER FEAR OF FLYING - BEHAVIOURAL TREATMENT WITH EXTENSIVE IN-VIVO EXPOSURE AND GROUP SUPPORT

RICHARD J. ROBERTS (New South Wales, University, Kensington, Australia) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 60, April 1989, p. 342-348. refs

The techniques used in the treatment of passenger fear of flying are described. They include behavior modification techniques (relaxation, systematic desensitization, and cognitive restructuring), an educational program, high in-vivo exposure, and group support. Results from self-rating scales and qualitative feedback from course participants during 1979-1985, show that the collective use of these techniques contribute significantly to a reduction of fear and discomfort associated with passenger flying. Author

A89-36120
TRENDS IN POLAND IN SPACE PSYCHOLOGY RESEARCH

JAN F. TERELAK (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 60, April 1989, p. 352-360. refs

The results of space psychology research carried out in Poland during the years 1981-1986 are discussed. The topics discussed are concerned with the following three research tasks: (1) individual and situational determinants of the human functioning in stress conditions, with special emphasis on the temperament, performance, and adaptation costs of an individual; the sources of uncertainty as an attribute of a cosmonaut's stress; and the relationship of the temperament and the physiological patterns of

reaction to various stress situations, (2) the functioning of a human in extreme situations, with particular attention given to the psychological costs of adaptation to social isolation, and the functioning of small task groups in the social isolation, and (3) the problem of decision making and the load imposed by activities requiring risk-taking decisions. I.S.

A89-36121
NEUROPSYCHOLOGICAL SCREENING OF AVIATORS - A REVIEW

MARIE T. BANICH, VALORIE C. ELLEDGE (Illinois, University, Champaign), and ALAN STOKES (Illinois, University, Savoy) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 60, April 1989, p. 361-366. Research sponsored by the Civil Aeromedical Institute. refs
 (Contract DOT-FA02-87-C-87068)

The utility of various contemporary mental-status tests for the use in a mini-mental state tests presently considered by the Federal Aviation Administration for the inclusion into the Aviation Medical Exam, is investigated. An examination of the two mini-mental state tests currently considered indicated that both tests are inadequate for the screening of aviators, for the following reasons: (1) these tests were designed to detect functioning deficits at levels far below those needed for proficient piloting, and (2) they are not sensitive to the whole range of abilities that are important for piloting performance. On the other hand, a review of currently existing tests indicated that there already exist simple tests sensitive to the degradation of skills important for piloting, such as attention, processing flexibility, and sequencing, which have a great potential to be combined into a useful and rapidly-administered screening mental-state test for pilots. I.S.

A89-37301
PSYCHOPHYSIOLOGICAL ASSESSMENT OF THE MOTOR SKILLS OF PILOTING DURING THE PROCESS OF PILOT REQUALIFICATION [PSIKHOFIZIOLOGICHESKAIA OTSENKA DVIGATEL'NOGO NAVYKA PILOTIROVANIIA SAMOLETA U LETCHIKOV PRI PEREUCHIVANII]

N. I. FROLOV and A. S. KUZ'MIN *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Jan. 1989, p. 54-57. In Russian. refs

The progress in the development of motor skills in pilots undergoing flight training in new types of aircraft was assessed using a magnetic recorder of the 'Tester' type to record the parameters of the control-stick (CS) movements relevant to the flight dynamics of flight or correction. Results were analyzed using statistical and structural methods. The results of the analyses demonstrated that, as the training proceeded, there was a steady decrease in the number, as well as in the amplitude, of the CS movements performed by pilots during various phases of flight. At the same time, the quality of the landing and other operations improved. The piloting strategy also changed. Instead of correcting a flight-course deflection there was a tendency to predict and avoid it. I.S.

A89-38272
SPACE STATION CREW TRAINING CONCEPT IN JAPAN

YASUSHI HORIKAWA, YASUHIKO FUJITA, KIYOTAKA YASHIRO (National Space Development Agency of Japan, Tokyo), and KAZUO INOUE (Kawasaki Heavy Industries, Ltd., Kobe, Japan) *IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1801-1805.*

The Space Station (SS) will be operated and managed on-orbit by eight crew members. The on-orbit tour for crew members is planned to be six months. A Japanese crew member will also perform onboard activity as a member of international partner after the first JEM launch. Japan has already selected the flight crew members for the First Material Processing Test (FMPT), but it is necessary that the Station flight crew members should be selected and trained, considering various factors related to a longer mission than the FMPT mission. Furthermore, the recruitment, crew selection and training activities should be continuously maintained. Author

A89-38587* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
COMMUNICATION AS GROUP PROCESS MEDIATOR OF AIRCREW PERFORMANCE

BARBARA G. KANKI and H. CLAYTON FOUSHEE (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, May 1989, p. 402-410. refs

Considering recent operating experience as a group-level input factor, aspects of the communication process between crewmembers (captain and first officer) were explored as a possible mediator to performance. Communication patterns were defined by a speech-act typology adapted for the flight-deck setting and distinguished crews that had previously flown together (FT) from those that had not flown together (NFT). A more open communication channel and greater first officer participation in task-related topics was shown by FT crews, while NFT crews engaged in more nontask discourse. Author

A89-39740
IS 'THE RIGHT STUFF' THE RIGHT STUFF?

JERROLD M. POST (George Washington University, Washington, DC) Space Policy (ISSN 0265-9646), vol. 5, May 1989, p. 99-102. refs

Consideration is given to the qualities and personality characteristics required of astronauts on a long-duration Space Station mission. The importance of interpersonal issue for an international crew on a permanently manned spacecraft is discussed. The qualities ascribed to previous astronauts are outlined and the differences between previous mission and a Space Station mission are noted. It is concluded that the qualities of previous astronauts are necessary for a long-term mission and that additional interpersonal skills may be required for working for long periods of time with an international crew. R.B.

A89-39744
HUMAN DIMENSIONS IN SPACE DEVELOPMENT

PHILIP R. HARRIS (California, University; Harris International, La Jolla) Space Policy (ISSN 0265-9646), vol. 5, May 1989, p. 147-154. refs

Biological and behavioral science issues related to space exploration and colonization are examined. Problems associated with living in a space environment for long periods of time are discussed, including group behavior and dynamics in space flight, the environment created at space stations, management on earth and in orbit, selection and training of space station inhabitants, and planning, establishing, and governing space settlements. Various aspects of human factors in space development are addressed, such as physical, sociological, financial, legal, managerial, psychological, cultural, political, education, and communication factors. R.B.

A89-39759
METHODS FOR COMPARING INDIVIDUAL AND GROUP-RELATED PURPOSEFUL SENSOMOTOR ACTIVITIES [METODIKA SRAVNENIIA INDIVIDUAL'NOI I GRUPPOVOI TSELENAPRAVLENNOI SENSOMOTORNOI DEIATEL'NOSTI]

IU. N. SAMKO, N. IA. BATOVA, and A. A. TIUNOVA (AMN SSSR, Institut Normal'noi Fiziologii, Moscow, USSR) Fiziologija Cheloveka (ISSN 0131-1646), vol. 15, Mar.-Apr. 1989, p. 158-161. In Russian. refs

The laws governing the purposeful sensomotor activity of an operator acting as an individual or as part of a group effort were investigated using a specially developed method for comparing the efficiency of subjects when tracing a marker on a screen along a given coordinate, when the subject was acting individually and as part of a group. It was shown that, in most cases, the efficiency of completing a task when acting as an individual was different from that when the operator was acting as part of a group, with some subjects exhibiting an improvement when passing to group activity conditions, and some showing a deterioration. I.S.

N89-22306# Joint Publications Research Service, Arlington, VA.
PSYCHOLOGICAL PREPARATION FOR MONOTONOUS ACTIVITY UNDER DESERT CONDITIONS Abstract Only

V. F. SOPOV In *its* JPRS Report: Science and Technology. USSR: Life Sciences p 12 13 Jul. 1988 Transl. into ENGLISH from *Izvestiya Akademii Nauk Turkmenskoy SSR: Seriya Biologicheskikh Nauk, Moscow (USSR)*, no. 1, Jan. - Feb. 1988 p 55-61

Avail: NTIS HC A03/MF A01

Psychological characteristics of individual reactions in adaptation to desert conditions were studied in order to develop methodology for psychological preparation for crossing the Karakuma desert on foot. The studies were performed in two phases: during the first stage the task was to discover differences in personalities, their reactivity to monotonous tasks and to find means of counteracting negative reactions by psychological self-control; the second phase was the actual crossing of the desert. In the preparatory phase two groups of sportsmen were identified: monophilic (resistant to monotony) and monophobic (nonresistant to monotony). These two groups were totally polarized in all their characteristics in two opposite directions. (Candidates for the desert crossing were assigned accordingly and psychological training was carried out. During the crossing the behavior was predictive. All members who went through the special training, even the monophobic ones, reacted adequately to monotonous conditions. Author

N89-22315# Allegheny County Community Coll., Pittsburgh, PA. Dept. of Behavioral Sciences.

TRANSFER OF TRAINING IN PROBLEM SOLVING Final Report

KENNETH KOTOVSKY Oct. 1988 11 p
 (Contract N00014-85-K-0696; RR04206)

(AD-A202850; REPT-88-3-ONR) Avail: NTIS HC A03/MF A01
 CSCL 05/8

This report summarizes the results of experiments that attempt to delineate problem characteristics that control transfer of training between problems, and to discover those characteristics that make problems hard or easy to solve. The problems used were sets of isomorphs of the Tower of Hanoi Problem, and a set of isomorphs of the very difficult Chinese Ring Puzzle. The experiments determined the relationship between transfer and the difficulty of both the source and target problems. They demonstrate the importance of similarity of representation for transfer, and the primacy of representation over stimulus characteristics of the problems. In addition, the role of transfer in learning the move operators in the problems, and the function of that learning as a substitute for problem exploration were demonstrated. The interaction of the processing demands involved in modifying a skill so that it can be transferred and the demands involved in solving the problem was also explored. The results are presented in detail in the attached technical reports. GRA

N89-22316# Naval Aerospace Medical Research Lab., Pensacola, FL.

AN IMPROVED AUTOMATED SELECTION SYSTEM FOR NAVY PILOTS Interim Report

RAY GRIFFIN 14 Jun. 1988 4 p

(AD-A203438; NAMRL-RIB-88-2) Avail: NTIS HC A02/MF A01
 CSCL 05/9

Since 1947, the Navy has relied on the Aviation Qualification Test (AQT) of general ability and the Flight Aptitude Rating (FAR) -- a composite of mechanical comprehension, spatial aptitude, and biographical tests--to select naval aviators. While this selection system has served the Navy well, the failure rate of pilot selectees has remained consistently high (although certainly less than the attrition rate before using a selection test battery), averaging 20 to 25 percent over the last 20 years. Two projects at the Laboratory that have demonstrated the potential for the improved prediction of both undergraduate and fleet flight performance are a naval aviator selection program and a fleet performance prediction program. Results from these two computerized projects are particularly exciting because for the first time in 40 years we have

demonstrated that cognitive and one-dimensional tracking tasks account for increased variance in predicting completion of primary flight training. That is, the tests predict those individuals who will pass or fail flight training, even after their initial selection using the present selection battery, the AQT/FAR. Alternately, using multidimensional tracking and multitask tests, we have demonstrated the ability to predict an individual's flight grade and the number of flight hours required to complete primary training. Finally, certain of the multitask tests even predict the air combat maneuvering performance of fleet pilots as they perform on instruments. GRA

N89-22317# Michigan Univ., Ann Arbor.
PERCEPTION OF COMPLEX DISPLAYS Final Technical Report, 1 Sep. 1982 - 31 Aug. 1988
 JOHN JONIDES 8 Dec. 1988 6 p
 (Contract AF-AFOSR-0297-82; AF PROJ. 2313)
 (AD-A204473; AFOSR-89-0031TR) Avail: NTIS HC A02/MF A01 CSDL 05/8

There were three foci of research during the granting period. First, a project was concerned with stimulus-driven shifts of attention. This project was concerned with setting boundary conditions on when salient stimuli in the visual periphery could elicit shifts of attention without shifts of fixation. Second, research was conducted to study the integration of visual information across successive fixations. This research examined a simple model of saccadic integration, a model that was found not to be supported by experimental evidence. Third, experimentation was conducted concerned with the mechanisms involved in programming saccadic eye movements. In addition to these projects, several other issues were raised during the research period that resulted in experimentation and subsequent publication of results. These issues had to do with the development of automaticity in mental processing, the perception of geometric illustrations, analysis of reaction time data, and attentional issues more generally. GRA

N89-22318# State Univ. of New York, Farmingdale.
HUMAN IMAGE UNDERSTANDING Final Report, 1 Feb. 1986 - 31 May 1988
 IRVING BIEDERMAN Jan. 1989 27 p
 (Contract AF-AFOSR-0106-86; AF PROJ. 2313)
 (AD-A204490; AFOSR-89-0002TR) Avail: NTIS HC A03/MF A01 CSDL 05/8

The goal of the effort is to develop and empirically evaluate a theory (Recognition-by-Components (RBC)) of real-time human target identification which assumes that objects are represented as an arrangement of simple generalized-cone volumes. The fundamental assumption of RBC is that a particular set of these convex components, called geons, can be derived from invariant properties of edges in a 2-D image. If an arrangement of three geons can be recovered from the input, objects can be quickly recognized even when they are occluded, rotated in depth, novel, extensively degraded, or embedded in a scene. The report describes the research on consequences of various forms of image degradation, the exploration of the role of surface features, the attentional demands of object recognition, formal modeling of object recognition, and extensions to scene perception and extensions to scene perception and expert identification. GRA

N89-22319# Minnesota Univ., Minneapolis. Dept. of Psychology.
COMPUTING SUPPORT FOR BASIC RESEARCH IN PERCEPTION AND COGNITION Final Report, 1 Aug. 1987 - 31 Jul. 1988
 CHARLES R. FLETCHER, GORDON E. LEGGE, MARY JO NISSEN, and NEAL F. VIEMEISTER 7 Dec. 1988 24 p
 (Contract AF-AFOSR-0280-86)
 (AD-A204795; AFOSR-89-0078TR) Avail: NTIS HC A03/MF A01 CSDL 05/8

This report describes the progress made the second and final year of an equipment grant which has provided a common computing environment for four laboratories conducting basic research in perception and cognition at the University of Minnesota.

Research in the Cognitive Psychology Laboratory has focused on developing a computer model of the interaction of declarative and procedural knowledge in skill acquisition. In the Visual Psychophysics Laboratory several image-enhancement algorithms have been developed as well as psychophysical procedures for evaluating those algorithms. Research in the Auditory Psychophysics Laboratory has concentrated on developing a model of the detection and recognition of complex auditory signals. In the Psycholinguistics Laboratory a computer model of text comprehension and recall has been assumptions of the model and show a good correspondence between its performance and that of college student subjects. GRA

N89-22320# Army Natick Research and Development Command, MA.
THE EFFECTS OF MICROENCAPSULATION ON SENSORIMOTOR AND COGNITIVE PERFORMANCE: RELATIONSHIP TO PERSONALITY CHARACTERISTICS AND ANXIETY Final Report, Oct. 1986 - Sep. 1987
 PHILIP H. WARREN, PAULA M. POOLE, and LYNDA C. ABUSAMRA Aug. 1988 75 p
 (AD-A204852; NATICK/TR-89/015) Avail: NTIS HC A04/MF A01 CSDL 05/8

The research examined the relationship between personality factors and the effects of microencapsulation in Mission Oriented Protective Posture level 4 (MOPP4) gear on performance and anxiety level. Acclimatization to the anxiety producing effects of MOPP4 was also investigated. For comparison purposes, subjects performed tasks and filled out questionnaires in both a Battle Dress Uniform (BDU) condition and MOPP4 condition. For each of the 12 volunteer military subjects, measures of subjective trait and state anxiety, self-reported personality traits, and various sensorimotor and cognitive performance measures were gathered. Personality factors, state and trait anxiety, and measures of sensorimotor and cognitive performance were related to each other in complex ways and to microencapsulation in MOPP gear. On the first day of donning MOPP4, subjects' state anxiety increased significantly. Over the course of five daily sessions of wearing MOPP4, the level of state anxiety decreased so that by the fifth day, the subjects no longer showed elevated state anxiety. Subjects who reported high levels of anxiety before or associated with introversion. Subjects who reported low anxiety before or after the daily test period reported characteristics associated with extraversion. Subjects who performed better on a balance beam task or correctly identified more visual stimuli on tachistoscope task tended to report characteristics of independence. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A89-36114
EFFECT OF HEAD OR NECK COOLING USED WITH A LIQUID-CONDITIONED VEST DURING SIMULATED AIRCRAFT SORTIES

J. B. COHEN, J. R. ALLAN, and P. J. SOWOOD (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 60, April 1989, p. 315-320. refs

The effectiveness of head or neck cooling in reducing head sweating and increasing subject comfort when used in conjunction with a liquid-conditioned vest during simulated sorties in the European Fighter Aircraft was investigated. Six subjects underwent three 2-h exposures at 40 C wearing the Aircrew Chemical Defence clothing and one of three combinations of liquid-conditioned garments. In all three exposures, a liquid-conditioned vest was

worn and, in two exposures, either a head-cooling cowl or a neck-cooling collar was worn in addition to the vest. All six subjects reported increased comfort and decreased head sweating with head cooling, a result supported by the data collected. Author

A89-36352#

AN IMPROVED LED CONTROL SYSTEM FOR MEASURING OPERATOR'S PERIPHERAL VISION IN A HUMAN CENTRIFUGE

MIKIO ONO and TERUAKI TAKETOMI Japan Air Self Defense Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 29, June 1988, p. 71-76. In Japanese, with abstract in English. refs

An improved LED control system has been developed for making continuous measurements of an operator's peripheral vision during centrifugal acceleration. The subcircuits of the system include a pulse generator, a counter/divider, and inverter and buffer, a perception signal and the power supply. The characteristics of the system are described and circuit diagrams of the system are presented. R.B.

A89-36371#

LIFE SUPPORT ON THE MOON AND MARS - THE INITIAL EXPLOITATION OF EXTRATERRESTRIAL RESOURCES

M. NOVARA (ESA, Mechanical Systems Dept., Noordwijk, Netherlands) ESA Bulletin (ISSN 0376-4265), no. 57, Feb. 1989, p. 33-39.

Scenarios for permanent manned stations on the moon and Mars are examined. The environmental conditions on the surfaces of the moon and Mars are outlined and the requirements of life support systems are discussed. Consideration is given to the possibility of growing plants on the moon or Mars, waste processing techniques, and the exploitation of lunar and Martian resources. R.B.

A89-36933*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

MODEL-BASED ANALYSIS OF CONTROL/DISPLAY INTERACTION IN THE HOVER TASK

SANJAY GARG (NASA, Lewis Research Center; Sverdrup Technology, Inc., Cleveland, OH) and DAVID K. SCHMIDT (Purdue University, West Lafayette, IN) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 12, May-June 1989, p. 342-350. Previously cited in issue 22, p. 3633, Accession no. A87-49580. refs (Contract NAG4-1)

A89-37221

AN EVALUATION OF A RADIOFREQUENCY PROTECTIVE SUIT AND ELECTRICALLY CONDUCTIVE FABRICS

KENNETH H. JOYNER, PAUL R. COPELAND, and IAN P. MACFARLANE (Telecom Australia, Research Laboratories, Clayton) IEEE Transactions on Electromagnetic Compatibility (ISSN 0018-9375), vol. 31, May 1989, p. 129-137. refs

A protective suit consisting of an overall with an integral hood, gloves, and oversocks, constructed of an electrically conductive fabric, has been examined theoretically and experimentally for EM shielding effectiveness (SE) at RF (200 kHz to 4 GHz). The suit, although originally developed to provide personnel protection in large electric-field gradients near overhead high-voltage 50/60-Hz power transmission lines, was claimed to provide whole-body protection for RF workers. The methods of measurement used and the experimental and theoretical results obtained are described, including details of the SE deficiencies. In particular, it is shown that resonant enhancement of RF fields can occur in the head region at microwave frequencies, and that no attenuation is provided for magnetic fields at frequencies below about 4 MHz. Minimum design criteria to be observed in the development of such suits are proposed. I.E.

A89-37237

AN EMPIRICAL STUDY COMPARING PILOTS' INTERRATER RELIABILITY RATINGS FOR WORKLOAD AND EFFECTIVENESS

LEONARD ADELMAN (George Mason University, Fairfax, VA) and MICHAEL L. DONNELL (Donnell and Associates, Inc., McLean, VA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 18, Nov.-Dec. 1988, p. 978-981. Research supported by the U.S. Navy. refs

Pilot workload and technical effectiveness have been considered to be essential criteria when evaluating aircraft operability with subjective rating techniques. However, validation studies of the mission operability assessment technique found considerably higher levels of interrater reliability for pilots' ratings of workload than for technical effectiveness. The finding was replicated across aircraft, pilots, tasks, and with different forms of the rating scales. These results suggest that the implicit assumption that interrater reliability will be high and essentially identical for both pilot workload and technical effectiveness ratings may be invalid. This finding has implications for how one defines and subsequently measures aircraft operability with subjective rating techniques. I.E.

A89-37241* Wisconsin Univ., Madison.

TELEPRESENCE FOR TOUCH AND PROPRIOCEPTION IN TELEOPERATOR SYSTEMS

DAVID G. HAGNER and JOHN G. WEBSTER (Wisconsin, University, Madison) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 18, Nov.-Dec. 1988, p. 1020-1023. Research supported by NASA. refs

The control and operation of mechanical manipulators by a human and the use of sensory tactile and force feedback is reviewed. The terms telepresence, teleproprioception, and teletouch are defined and relevant technologies that have or could have been applied to teleoperation are discussed. An ideal method of tactile sensory feedback for teleoperators that is based upon reproduction of the object's contour is discussed, and its practicality considered. Previously developed components that could be used to build a system incorporating sensory tactile and force feedback are presented. I.E.

A89-37664

HUMAN ENGINEERING CONSIDERATIONS IN THE APPLICATION OF COLOR TO ELECTRONIC AIRCRAFT DISPLAYS

SAE Aerospace Recommended Practice, SAE ARP 4032, April 4, 1988, 22 p. refs (SAE ARP 4032)

The use of color in cockpit visual displays has been demonstrated to be superior to symbol shape, size, etc., as an aid to graphics search-and-identify efforts of crewmembers. A given color maintains its attention-demanding value if it is used sparingly and consistently; the traditional warning and cautionary colors, red and yellow, should accordingly be reserved for these uses only. The number of colors employed by a display should be kept to a minimum in order to reduce clutter. Color's greatest usefulness is in coding schemes for qualitative information. O.C.

A89-38177

SPACE EXPERIMENT SUPPORT SYSTEM

KOHTARO MATSUMOTO, MASAO NAKA, HIROMICHI YAMAMOTO, SHOUCHI YOSHIHARA (National Aerospace Laboratory, Chofu, Japan), KIYOSHI TOHDO (Fujitsu FACOM Information Processing Corp., Tokyo, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 1. Tokyo, AGNE Publishing, Inc., 1988, p. 1129-1134.

The development of an AI-based experiment support system for the JEM is discussed. The feasibility of the concept is examined and results from tests using a system prototype are presented. Consideration is given to the development of two prototype subsystems: an electric manual system to convert the experiment

manual into a knowledge base and a mission scheduling system for use in planning experiments. R.B.

A89-38211

CONTROL OF A FLEXIBLE SPACE MANIPULATOR WITH THREE DEGREES OF FREEDOM

TOSHIO FUKUDA (Tokyo, Science University, Japan) and ATSUSHI ARAKAWA IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 1. Tokyo, AGNE Publishing, Inc., 1988, p. 1349-1354. refs

A flexible robotic arm with three degrees of freedom is modeled assuming that the links vibrate both transversely and torsionally and that they do not vibrate longitudinally. Based on these assumptions, the dynamics of the three-degrees-of-freedom flexible robotic arm is derived and represented by a set of coupled modal equations, neglecting nonlinear terms. The state feedback control method is used to suppress the coupled vibrations. Author

A89-38257

THE CATALYTIC WET-OXIDATION OF AMMONIUM ACETATE FOR CELSS

YUKIO TAKAHASHI and SHIGERU ISOBE (Niigata University, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1689-1694. refs

Acetic acid and ammonium acetate were wet-oxidized in a batchwise operation with and without catalysts. Their oxidizability and performance of Ru-Rh catalysts on ceramic honeycombs were studied. Acetic acid itself was not oxidized at all without a catalyst. In 16 repeated batch tests, where the Ru-Rh catalyst was used and fresh ammonium acetate was introduced each time to the reactor, the oxidation efficiency ranged from 89.9 to 97.8 percent with an average of 93.8 percent, and the denitrification efficiency was from 96.1 through 99.0 percent, at a temperature of 280 C. Efforts were concentrated on closing the carbon and nitrogen balance. The carbon recovery ranged from 94.1 to 103.7 percent and the nitrogen recovery was from 85.3 through 99.0 percent. Author

A89-38258

WET-OXIDATION WASTE MANAGEMENT USING CATALYST IN CELSS

MITSUO OGUCHI, KEIJI NITTA, KOJI OTSUBO (National Aerospace Laboratory, Chofu, Japan), YUKIO TAKAHASHI (Niigata University, Japan), ISAO NISHI (Tokyo, Science University, Noda, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1695-1699.

Experimental results were obtained to determine the applicability of the wet oxidation waste-management method to the CELSS. Under a reaction temperature of 280 C and an initial oxygen pressure of 50 kgf/sq cm, the chemical oxygen demand (COD) was reduced from 20,000 ppm of raw materials to 3,500 ppm and the Kjeldahl nitrogen concentration was decreased from 30,000 ppm to 350 ppm. In tests using such catalysts as Pd, Ru, and Ru + Rh, the COD was reduced from 20,000 ppm to 70-300 ppm and the Kjeldahl nitrogen values were reduced from 30,000 to 40-100 ppm. R.R.

A89-38259

SPACE STATION AND MANNED SPACE TECHNOLOGY - WET CATALYTIC OXIDATION PROCESS FOR WASTEWATER TREATMENT IN CELSS

YOSHIKI HARADA (Osaka Gas Co., Ltd., Research Center, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1701-1708.

This paper presents a technology for wastewater treatment and its recycling in the controlled ecological life of a space station. The catalytic wet oxidation process planned to be applied in the system is a method of wastewater treatment using a newly

developed solid catalyst. By using the catalyst under high temperature and pressure (200-270 C, 40-90 kg/sq cm G), concentrated ammonia, COD (chemical oxygen demand), and BOD (biological oxygen demand) components and suspended solids in wastewaters can be simultaneously oxidized and treated with high efficiency in a single step without dilution. The pollutants are converted into harmless N₂, CO₂ and H₂O, and besides, the wastewater is decolorized, deodorized, and sterilized. Author

A89-38260

A GROUND EXPERIMENTAL MODEL OF WATER DISTILLATION SYSTEM BY THERMOPERVAPORATION FOR SPACE

KEIJI NITTA, KOJI OTSUBO, MITSUO OGUCHI, TOSHIHARU TANEMURA (National Aerospace Laboratory, Chofu, Japan), KENJI MITANI (Hitachi, Ltd., Space Systems Div., Yokohama, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1709-1712.

A ground experimental model of a water distillation system based on the thermopervaporation method has been constructed. The basic experiments with this model have been performed. It is shown that the permeating rate is 0.8 l/hr for an effective area of 0.28 sq m and the rejection rate of any components, except for ammonia, is greater than 96 percent (almost all of data show 100 percent rejection). Reduction of ammonia can be made by activated charcoal. Thus, the system has shown feasibility for space use. Author

A89-38261

GAS EXCHANGE BY CHLORELLA WITH THE HYDROPHOBIC MICROPOROUS MEMBRANE

KANJI MATUMOTO, HIROSHI TERANISHI, HARUHIKO OHYA (Yokohama National University, Japan), MITUO OGUTI (National Aerospace Laboratory, Chofu, Japan), ISAO ENDO (Institute of Physical Research, Saitama, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1713-1718. refs

The absorption of CO₂ and O₂ gas into a chlorella suspension and the stripping of O₂ gas, which is generated by photosynthesis in chlorella, by a hydrophobic microporous hollow-fiber membrane made of polypropylene were investigated. The overall mass transfer coefficient of CO₂ and O₂ gas for absorption was found to depend only on the flow rate of suspension in the fibers. The membrane area required to obtain the maximum generation rate of O₂ gas is estimated using the overall mass transfer coefficient, the chlorella concentration, and the CO₂ concentration in the feed-gas mixture. R.R.

A89-38262

CONCEPTUAL STUDY ON CARBONDIOXIDE REMOVAL, CONCENTRATION AND OXYGEN GENERATION SYSTEMS

KYOICHI MANABE (National Space Development Agency of Japan, Tokyo), TAKATOSHI SHOJI, HIROYUKI MATSUMURA, MASAO HAYASHITANI, TAIKI WATANABE (Kawasaki Heavy Industries, Ltd., Akashi, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1719-1724. refs

This report deals with the Environmental Control and Life Support Systems (ECLSS) for manned space activities. In enclosed spacecraft, it is necessary to supply O₂ gas to crew members and to remove CO₂ gas in the cabin. If metabolic CO₂ gas can be reduced safely on orbit to carbon (C) and oxygen (O₂), it will be possible to use O₂ gas efficiently, and the amount of O₂ to be carried will be greatly decreased. From the experimental studies conducted so far, the following results were obtained: (1) solid amine CO₂ adsorption method is most favorable for CO₂ removal; (2) both BOSCH and SABATIER methods can be used but the BOSCH method is more efficient in reducing CO₂ to H₂O; and (3) the solid polymer electrolysis of water is the most preferable method for generating pure O₂ gas. Author

A89-38263

DEVELOPMENT OF A GAS RECYCLING SYSTEM TEST UNIT
SHUJI KANDA, HIROYUKI MATSUMURA, TAKATOSHI SHOJI (Kawasaki Heavy Industries, Ltd., Kobe, Japan), KEIJI NITTA, KOJI OTSUBO (National Aerospace Laboratory, Chofu, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1725-1729.

As part of the gas Recycling System development for the CELSS, a scale model test unit of a gas separating process is developed. Using this test unit with Salcomine as a regenerative O₂ absorber, O₂-separating tests are carried out, and it is verified that this test unit can accomplish a stable continuous O₂-separating operation. From the test results, some practical design parameters of an O₂-separating system, such as O₂ absorbing and desorbing characteristics of Salcomine in canisters, are obtained. Author

A89-38264

GAS BALANCING METHOD FOR MINIMIZING THE VOLUME OF O₂ AND CO₂ RESERVOIRS IN CELSS

KEIJI NITTA, KOJI OTSUBO, MITSUO OGUCHI, and TOSHIHARU TANEMURA (National Aerospace Laboratory, Chofu, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1731-1741. refs

The gas balance in a CELSS-type closed system with a minimum reservoir capacity is shown to be achieved by controlling the photosynthetic reaction of plants via stabilization of the O₂ and CO₂ partial pressures. The stabilization of the gas environment using incineration and physicochemical oxygen recovery systems such as the Sabatier reaction is discussed. Also considered are the necessary and sufficient quantities of plant cultivation for supporting a one-man crew, the quantities of human waste and inedible plant parts generated in CELSS, and the oxygen requirements for human respiration and the oxidation of wastes and inedible plant parts. R.R.

A89-38265

CONSTRUCTION OF CLOSED ALGAL (SPIRULINA) CULTIVATION SYSTEM FOR FOOD PRODUCTION AND GAS EXCHANGE IN SPACE

MITSUO OGUCHI, KOJI OTSUBO, KEIJI NITTA (National Aerospace Laboratory, Chofu, Japan), ATSUHIRO SHIMADA, SHIGEO FUJII (Toa Nenryo Kogyo, Corporate Research and Development Laboratory, Saitama, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1743-1749.

A closed continuous algal (spirulina) cultivation system was constructed. Both carbon dioxide and medium supply to the culture and algal mass and oxygen separation from the culture were conducted automatically by a computer, while the pressure inside the culture vessel was kept constant in the closed system. This model is a primary model for ground experiments before the experiments of culturing Spirulina in a Space Station. The feasibility of culturing Spirulina in a closed recycling system is discussed on the basis of data obtained by use of this new system. Author

A89-38270

STUDY OF MAN-SYSTEM FOR JAPANESE EXPERIMENT MODULE (JEM) IN SPACE STATION

HIDETAKA TANAKA, NORIFUMI IKEDA, KIMIKO HASEGAWA (Mitsubishi Heavy Industries, Ltd., Tobishima, Japan), and TAKAO YAMAGUCHI (National Space Development Agency of Japan, Tokyo) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1789-1793.

Japanese Experiment Module (JEM) is one of the Space Station elements planned to be launched in 1997, and to be the first manned space system in Japan. The JEM will be attached to the NASA Space Station. In the JEM, various space environment utilization experiments will be carried out under the administration of the JEM management system. Included in the JEM man system

is the hardware which supports crew safety, health, hygiene, nutrition, JEM operations, housekeeping and stowage. This paper clarifies the JEM man system concept and main man-machine interfaces such as the workstation, the workbench, etc. Author

A89-38273

RELIABILITY OF MAN-MACHINE-ENVIRONMENT SYSTEM

JINBIAO SUN and LIPING SHEN (Institute of Space Medico-Engineering, Beijing, People's Republic of China) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1807-1811.

A man-machine-environment system engineering model is used to study the safety and reliability of manned space flight. Special attention is given to such aspects of human reliability as perception, information processing, procedure selection, operation execution, and physiological and psychological factors. Environmental aspects considered include ground and space factors, machine-induced factors such as shock and vibration, and factors influenced by man such as atmospheric composition, temperature, and humidity. R.R.

A89-38276

REMOTE MANIPULATOR SYSTEM OF JAPANESE EXPERIMENT MODULE

KOJI YAMAWAKI, KESATOSHI KURAOKA (National Space Development Agency of Japan, Tokyo), TAMUJIRO SUMI, RYO OKAMURA, and JUNICHI KATO (Toshiba Corp., Kawasaki, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1825-1829. refs

This paper presents an overview of the current development status of the remote manipulator system of the Japanese Experiment Module (JEM). The manipulator system is mainly characterized by a combination of a 10-m main arm and a 2-m small arm that can be attached on orbit to the main arm and used for tasks requiring dexterity. While basic control of the main arm is executed automatically, the small arm is principally teleoperated by a master-slave bilateral control system. Visual information to the operator is provided by TV system beside a window of the pressurized JEM module. Author

A89-38277

LIFE SUPPORT SYSTEMS FOR EUROPEAN MANNED SPACE VEHICLES

A. INGEMER SKOOG (Dornier System GmbH, Friedrichshafen, Federal Republic of Germany) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1831-1840.

Life support systems (LSSs) for the Columbus module, the Hermes spaceplane, and the European EVA space suit are discussed. In the Columbus attached pressurized module, regenerative functions are provided for CO₂ removal (solid amine) and contamination control (a catalytic burner), and the International Space Station core element provides the supply of oxygen, nitrogen, and water. A nonregenerative concept is planned for CO₂ removal in Hermes. The European space suit LSS is an open loop design, with CO₂ removal by LiOH and thermal control by means of a condensing heat exchanger and sublimator. R.R.

A89-38278

JEM ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM

K. SHIRAKI, K. MANABE (National Space Development Agency of Japan, Tokyo), H. FUJIMORI, A. HATTORI, and H. HAMA (Kawasaki Heavy Industries, Ltd., Kobe, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1841-1850.

As a result of the preliminary study for the Environmental Control and Life Support System (ECLSS) of the Japanese Experiment

Module (JEM), the functions of the JEM ECLSS were defined as follows, considering accommodation for JEM various operation and system redundancy requirements: atmosphere control and supply, temperature and humidity control (including intramodule and intermodule air ventilation), atmosphere revitalization (CO₂ removal, contamination control and monitoring), fire detection and suppression, water management, and rescue provision. Author

A89-38279

IMPACT OF CONCENTRATED CARBON DIOXIDE PURITY ON SPACE STATION ARS INTEGRATION

ROSS J. CUSHMAN and TIMOTHY D. SCULL (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1857-1862.

The impact of air (acting as an impurity in the concentrated CO₂) on the advanced carbon reactor (ACR) and Bosch CO₂-reduction subsystems, and other subsystems, of the ECLSS atmospheric revitalization system (ARS) have been quantified. It is shown that either of the CO₂ reduction technologies can be sized with respect to compressor capacity and operated to minimize the overall impact on the ARS of having less than 100 percent pure CO₂. Optimized impacted ARS equipment power penalties range from as low as 65 watts (for 1 percent air entering the ACR system) to as high as 500 watts (for 4 percent air entering the Bosch system). R.R.

A89-38280

A STUDY ON THE AIR DIFFUSION PERFORMANCE FOR ENVIRONMENTAL CONTROL IN THE SPACE STATION

AKIRA MASUMOTO, TADASHI KOBAYASHI, HITOSHI IWASAKI (Kawasaki Heavy Industries, Ltd., Life Support Engineering Dept., Kobe, Japan), and MASATOSHI HIROKAWA (Kawasaki Heavy Industries, Ltd., Thermal Engineering Research Laboratory, Akashi, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1863-1870.

In carrying out experiments in the experiment module of the Space Station, the crew members of scientist are in shirt sleeves. For the environmental control to obtain comfortable conditions under the nongravitation in the Station, the air-diffusion performance is one of the fundamental performance factors. This paper describes simulation analyses on the air diffusion performance under the nongravitation and the environmental control performance, and offers conclusions about the optimization of the air circulation system. Author

A89-38281

A STUDY ON REMOVAL OF TRACE CONTAMINANT GASES

K. MANABE (National Space Development Agency of Japan, Tokyo), H. ITOH, S. MITSUDA, Y. KUBO (Kawasaki Heavy Industries, Ltd., Akashi, Japan), S. FUJITA (Kawasaki Heavy Industries, Ltd., Kobe, Japan) et al. IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1871-1876.

Over 200 trace gaseous contaminants have been detected in cabin atmospheres from manned spacecraft. Consequently, the Trace Contaminant Control System shall be provided as a subsystem of the Environmental Control and Life Support System in the Japanese Experiment Module (JEM) attached to the Space Station, and atmospheric contaminants shall be kept below their Maximum Allowable Concentration. An adsorption and catalytic oxidation process has been adopted as the most preferable technology by the JEM subsystem investigation implemented on the phase B preliminary study. Author

A89-38282

THERMAL CONTROL SYSTEM FOR JAPANESE EXPERIMENT MODULE

SUECHIKA MASUDA (National Space Development Agency of Japan, Tokyo), MINORU MIZUNO, and KEIZO NAKAO

(Ishikawajima-Harima Heavy Industries, Co., Ltd., Tokyo, Japan) IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 1877-1882.

The baseline configuration of the Thermal Control System (TCS) of the Space Station (SS) Japanese Experiment Module (JEM) is defined by a preliminary design study. The preliminary design study was performed for two and a half years from 1985 to 1987 in order to define the functions of the JEM TCS, the functional/physical interfaces between the JEM TCS and the SS core TCS, the other systems and/or subsystems. This paper describes the baseline configuration as well as the significant trade-offs and analyses performed during the preliminary design phase. Author

A89-38383

HARDWARE SIMULATION OF RETRIEVING A TARGET BY SPACE MANIPULATOR IN 0-GRAVITY ENVIRONMENT

SHUICHIRO FUKUZAWA IN: International Symposium on Space Technology and Science, 16th, Sapporo, Japan, May 22-27, 1988, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1988, p. 2571-2575.

The design and simulation testing of an autonomous-type 4-DOF space manipulator system for use on free-flying platforms are reported. The system comprises a CCD camera as optical sensor, a target, a robot arm with four rotational DOFs, and a 16-bit microcomputer. The basic equations of motion and the control law are outlined; various techniques for simulating zero-gravity conditions on the ground are discussed; and results obtained using a gimbal method are summarized. The validity of the simulation and the asymptotic stability of the closed-loop control law are demonstrated, and it is shown that the translational and rotational DOFs of the spacecraft should be completely separated. T.K.

N89-22305# Joint Publications Research Service, Arlington, VA. **ENGINEERING AND PSYCHOLOGICAL PROBLEMS OF EFFECTIVENESS OF DISPLAYS REPRESENTING AIRCRAFT SPATIAL POSITION (REVIEW) Abstract Only**

I. YE. TSIBULEVSKIY *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 12 13 Jul. 1988 Transl. into ENGLISH from Vestnik Moskovskogo Universiteta, Seriya 14: Psikhologiya, Moscow (USSR), no. 1, Jan. - Mar. 1988 p 3-23 Avail: NTIS HC A03/MF A01

A review and analysis of experimental materials was presented covering the comparative effectiveness of various display systems for indicating the spatial position of airplanes. Aviohorizons of two types are presently used: one with a moving airplane indicator and one with a moving horizon. The former is more effective, allowing fewer false movements, faster estimation of the spatial position, a faster learning process and more accurate aiming at air targets. In laboratory tests an important factor is movement of the trainer cabin. It was concluded that a trainer with an immobile cabin recreates more realistic conditions than a movable cabin. Studies showed a poor effectiveness of kinalog, an experimentally designed banking indicator with frequency separation showed better results both in training and in actual flying. Two approaches were proposed to aviation displays of flight information using the principle of picture realism and the principle of agreement with the flight view. The latter was preferred by aviation psychologists and highly qualified pilots. Author

N89-22321# Anacapa Sciences, Inc., Fort Rucker, AL. **TASK ANALYSIS OF THE UH-60 MISSION AND DECISION RULES FOR DEVELOPING A UH-60 WORKLOAD PREDICTION MODEL. VOLUME 2: MISSION ANALYSIS APPENDIXES A-E Interim Report, Dec. 1986 - Dec. 1987**

CARL R. BIERBAUM, SANDRA M. SZABO (Anacapa Sciences, Inc., Saint Louis, MO.), and THEODORE B. ALDRICH Dec. 1987 117 p

(Contract MDA903-87-C-0523; AF PROJ. A793) (AD-A201486; ASI690-302-87-VOL-2; ARI-A-88-36) Avail: NTIS HC A06/MF A01 CSCL 23/2

The announcement presents the appendixes to a com-

prehensive task analysis of the UH-60 mission conducted using a composite scenario. The analysis used a top-down approach to identify the phases, functions, and tasks for the mission. Nine phases, 34 segments, 48 functions, and 138 tasks were identified. The crew member performing each task was also identified, and estimates of the sensory, cognitive, and psychomotor workload associated with the tasks were derived. Estimates of the task times were derived as well. GRA

N89-22322 Ohio State Univ., Columbus.
A METHODOLOGY FOR PREDICTING PILOT WORKLOAD
 Ph.D. Thesis

THOMAS FREDERICK SCHUPPE 1988 318 p
 Avail: Univ. Microfilms Order No.DA8824600

The feasibility of predicting a pilot's workload in a single-seat aircraft was investigated. A model was developed which combined discrete event simulation output with an existing workload methodology to predict workload. The methodology used was the Subjective Workload Assessment Technique (SWAT), which recognizes three dimensions of workload, time load, mental effort load, and psychological stress load. Discrete event simulation output provided estimators for the time load dimension while pilots' subjective estimates were used for the other two SWAT dimensions. Using a queueing analogy with the pilot modeled as the server and the pilot's tasks as customers, several modeling options were investigated in the discrete event simulation. The main issue examined was whether processing tasks in series or parallel produced more accurate workload predictions. In the parallel model, the number of tasks that could be processed simultaneously was dependent on the particular combination of tasks currently requiring pilot resources. With each task demanding specified resources, the availability of pilot resources was determined by reference to the Multiple Resource Model. Three different measures from the simulation model were evaluated as surrogates for the SWAT time load dimension: pilot idle time, task interruption rate, and the simultaneous task rate. The predictions of the workload model were validated by comparison to SWAT workload measurements taken under identical conditions in a high-fidelity flight simulator. From a model viewpoint, little difference in prediction accuracy between the serial and parallel simulation models was found when pilot idle time was used as the surrogate predictor. When evaluating predictors, the most accurate results were produced using pilot idle time and the simultaneous task rate predictors.

Dissert. Abstr.

N89-22323# Naval Aerospace Medical Research Lab., Pensacola, FL.

FURTHER PROGRESS IN DEVELOPMENT OF A PERFORMANCE-BASED TEST OF GAZE CONTROL CAPABILITY Interim Report, Oct. 1983 - Mar. 1988

W. C. HIXSON, FRED E. GUEDRY, JR., and J. M. LENTZ Sep. 1988 22 p
 (AD-A204394; NAMRL-1342) Avail: NTIS HC A03/MF A01 CSCL 06/4

A performance-based test of gaze capability has been developed using low-cost light-emitting-diode (LED) displays operated under the semi-automated control of a desk top micro-computer. The test is based on the ability of an individual to rapidly shift his gaze over a relatively large angle and precisely identify digits presented in a numeric array for brief, time-varied exposure times. The new test, involving four widely-spaced displays, allows the derivation of performance scores for gaze shifts involving head movements made in the left, right, up, and down directions. The results of three experiments involving Navy and Marine Corps flight candidates as subjects, support the original report findings relative to the heavy influence of exposure time on performance, and most importantly, the wide range of performance capabilities reflected within the study population. This latter point has the potential for operational significance in that the test should distinguish pilots with exceptional gaze capabilities from those with relatively poor gaze performance. GRA

N89-22324# Bio-Dynamics Research and Development Corp., Eugene, OR.

ANTHROPOMETRIC COMPARISONS BETWEEN FACE MEASUREMENTS OF MEN AND WOMEN Final Report, Jul. 1986 - Dec. 1987

EDWARD SCHAFFER and BARRY T. BATES Jun. 1988 81 p
 (Contract F33615-86-C-0547)
 (AD-A204537; AAMRL-TR-88-027) Avail: NTIS HC A05/MF A01 CSCL 23/2

This report documents some of the differences in the body proportions of men and women in the region of the head and face. The study utilized discriminate analysis to pinpoint multivariate differences and regression analysis to indicate the magnitude of these differences from an applications' standpoint. The coefficients and estimates from these analyses are presented. It appears that for men and women who have the same facial breadth and length there are still considerable differences, particularly in the chin region. Consequently, it seems that for equipment designed to fit the face, sizes which are proportioned for men may not adequately fit women, even though the size may be small. It seems advisable to try to account for these differences at the design stage to ensure that both sexes are represented. This could reduce the number of sizes needed overall. GRA

N89-22325# Bio-Dynamics Research and Development Corp., Eugene, OR.

ANTHROPOMETRIC COMPARISONS BETWEEN BODY MEASUREMENTS OF MEN AND WOMEN Final Report, Jul. 1986 - Dec. 1987

EDWARD SCHAFFER and BARRY T. BATES Jun. 1988 85 p
 (Contract F33615-86-C-0547)
 (AD-A204698; AAMRL-TR-88-020) Avail: NTIS HC A05/MF A01 CSCL 23/2

This report documents some of the differences in the body proportions of men and women in the region of the torso and legs. The study utilized discriminate analysis to pinpoint multivariate differences and regression analysis to indicate the magnitude of these differences from an applications' standpoint. The coefficients and estimates from these analyses are presented. It appears that men and women are proportioned so differently that it should be nearly impossible to have a single sizing system for coverall or flight suit types of clothing or equipment. GRA

N89-22326# Smith-Kettlewell Inst. of Visual Sciences, San Francisco, CA. Eye Research Foundation.

VISUAL PROCESSING OF OBJECT VELOCITY AND ACCELERATION Final Technical Report, 1 Oct. 1985 - 30 Sep. 1988

SUZANNE P. MCKEE Sep. 1988 4 p
 (Contract AF-AFOSR-0380-85; AF PROJ. 2313)
 (AD-A205090; AFOSR-89-0194TR) Avail: NTIS HC A02/MF A01 CSCL 06/4

The human ability to discriminate small differences in velocity has been used to explore human motion processing. Velocity discrimination is independent of target contrast above a contrast of 2 to 5 percent. A model based on the ratio of signals in two temporal mechanisms (sustained and transient) can explain this contrast independence at low contrast levels, but fails at high contrast levels. Human observers have difficulty detecting acceleration which may be due to physiological summation (integration) of the velocity signals from many motion sensors. Human observers cannot use disparity information to translate the angular velocity signal (deg/sec) into a precise estimate of objective velocity (cm/sec), a result that suggests that there is no mechanism for velocity constancy. GRA

N89-22327# Ohio State Univ., Columbus.

AERONAUTICAL DECISION MAKING: COCKPIT RESOURCE MANAGEMENT Final Report

RICHARD S. JENSEN Jan. 1989 179 p Prepared for Systems Control Technology, Inc., Arlington, VA
 (Contract DTFA01-80-C-10080)

(AD-A205115; DOT/FAA/PM-86/46) Avail: NTIS HC A09/MF A01 CSCL 05/8

Aviation accident data indicate that the majority of aircraft mishaps are due to judgment error. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. Training programs using prototype versions of these materials have demonstrated substantial reductions in pilot error rates. The results of such tests were statistically significant and ranged from approximately 10 to 50 percent fewer mistakes. This manual is designed to explain the risks associated with flying activities involving multi-crew aircraft, the underlying behavioral causes of typical accidents, and the effects of stress on pilot decision making. The objective of this material is to enhance interpersonal communication and to facilitate effective leadership and coordination between crewmembers. It provides a sophisticated approach to developing concerted action based on optimal decision making. Several Cockpit Resources Management (CRM) principles are presented in the manual; included are delegation of responsibilities, prioritization, vigilance and monitoring, joint discussion and planning, and receptive leadership techniques. This manual is one of a series on Aeronautical Decision Making (ADM) prepared for the following pilot audiences: Student and Private, Instructor, Instrument, Helicopter, and Multi-crew. GRA

N89-23067# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

A REAL-TIME SIMULATOR FOR MAN-IN-THE-LOOP TESTING OF AIRCRAFT CONTROL SYSTEMS (SIMTACS-RT) M.S.

Thesis

GARY G. DAMERON Dec. 1988 136 p
(AD-A202599; AD-E900870; AFIT/GE/ENG/88D-8) Avail: NTIS HC A07/MF A01 CSCL 01/4

A real time, high fidelity simulator is constructed to model F-16 dynamics and control laws. Built around and Electronics Associates Incorporated (EAI) SIMSTAR hybrid computer, the simulator (SIMTACS-RT) uses nonlinear, coupled differential equations for its dynamic model. An EAI FGS 300 function generator is used to access an aerodynamic data base of 25000 values in real time. Man-in-the-loop simulation is supported with a force stick for pilot inputs and an oscilloscope display for pitch and roll information (the lateral program is still in development). Four hybrid computer programs are presented as user ready simulation/analysis tools, supporting both multi-rate digital and analog control laws. Recommendations for further improvement in simulator realism are presented. GRA

N89-23068*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

THE SPACE STATION FLIGHT TELEROBOTIC SERVICER AND THE HUMAN

KELLI F. WILLSHIRE, JAMES G. WATZIN (National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.), and PHYLLIS K. MILLEN Apr. 1989 34 p Presented at the 2nd International Conference on the Human-Computer Interaction, Honolulu, HI, 10-15 Aug. 1987

(NASA-TM-100615; NAS 1.15:100615) Avail: NTIS HC A03/MF A01 CSCL 05/8

The Space Station Flight Telerobotic Servicer (FTS) and its human-machine interaction issues are described. Included is a discussion of the FTS strawman concept and the FTS workstation human factor issues. Author

N89-23069# CHI Systems, Inc., Blue Bell, PA.
AN EXPERIMENTAL ENVIRONMENT AND LABORATORY FOR STUDYING HUMAN INFORMATION PROCESSING IN NAVAL AIR ASW (NAVAL AIR ANTISUBMARINE WARFARE)
Technical Report, 30 Sep. 1987 - 29 Sep. 1989

WAYNE ZACHARY and MONICA C. ZUBRITZKY 20 Oct. 1988 71 p
(Contract N00014-87-C-0814)
(AD-A204774; TR-881020-8704) Avail: NTIS HC A04/MF A01 CSCL 23/2

This report documents a laboratory facility to support

experimental research into human-computer interaction and decision-making in Naval Air Anti-Submarine Warfare mission management. The facility contains three components, all of which run on a SUN Workstation; 1) a simulated Air ASW workstation and mission, 2) experimental design tools, and 3) a data collection and transformation tools. The workstation/simulation simulation provides a realistic yet simplified version of ASW mission management as performed by the Tactical Coordinator (TACCO) on board a Naval ASW aircraft. Embedded in this simulation are automated data collection programs which collect keystroke-level data on TACCO actions as well as on the situational and display context within which the actions were taken. Additional tools translate these data into timelines and other forms needed to support the building of GOMS- and blackboard-based cognitive models of the human operator. The experimental design tools provide experimenter-friendly utilities for the creation of experimental problems with desired physical and cognitive demands on the subject. The laboratory is also designed to support implementation and experimentation with advanced adaptive user interfaces to the TACCO based on the cognitive models currently being developed. GRA

N89-23070# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.

AN IN-FLIGHT INVESTIGATION OF WORKLOAD ASSESSMENT TECHNIQUES FOR CIVIL AIRCRAFT OPERATIONS

R. C. VANDEGRAAF 26 Aug. 1987 132 p

(Contract NIVR-01406N)

(NLR-TR-87119-U; ETN-89-94197) Avail: NTIS HC A07/MF A01

An in-flight study to assess short-term workload was set up to investigate the problem of drawing conclusions from a variety of experimental measures in a complex task situation. Several implications are pointed out, such as dealing with mutually different outcomes, the designation of artefacts, and the problem of formulating final conclusions without the (a priori) availability of a method for evaluating other methods. An experimental program based on normal approach conditions for transport aircraft is outlined. The considered measures include pilot and safety pilot ratings (McDonnell 10-point rating scale, SWAT 3x3 rating matrix), measures of the pilot's heart rate, and measures reflecting control activity and task performance. The usefulness of two (pilot-aircraft) model-based methods (using the HRA and PROCURU computer programs) was examined. The experimental results show the necessity of the use of a set of different measures to guarantee a reliable assessment. Pros and cons of different measures are discussed. A strategy dealing with the formulation of final conclusions based on the outcomes of a variety of measures is considered. ESA

N89-23071# State Univ. of New York, Buffalo. Pulmonary Div.
EFFICACY OF CONVENTIONAL AND HIGH-FREQUENCY VENTILATION AT ALTITUDE Final Report, Jul. 1985 - Dec. 1986

ROBERT A. KLOCKE, ALAN T. AQUILINA, BRYDON J. GRANT, ALAN R. SALTZMAN, PATRICIA A. LAND, and NEEL B. ACKERMAN, JR. (Department of the Air Force, Washington, DC.) Dec. 1988 62 p

(Contract F33615-83-D-0601)

(AD-A205922; USAFSAM-TR-88-10) Avail: NTIS HC A04/MF A01 CSCL 23/5

High-frequency ventilation (HFV) is a promising mode of ventilatory support and could be useful in aeromedical evacuation. There have been no studies to date to examine the feasibility of maintaining gas exchange with HFV at reduced barometric pressure. This report investigates: (1) the role of molecular diffusion in gas transport during HFV, and (2) the ability to maintain gas exchange with HFV at simulated altitude in healthy and in diseased lungs. The role of molecular diffusion was tested by determining the rate of pulmonary uptake of six tracer gases with low aqueous solubility but different molecular weights during conventional and high-frequency ventilation. The inspired gas and the subsequent rate of appearance of these gases in arterial blood were monitored.

With conventional mechanical ventilation (CMV), there was separation of the gases with appearance in arterial blood occurring in order of increasing molecular weight. With HFV, there was a slight molecular weight effect, but substantially less than that seen with CMV. These findings indicate that the role of molecular diffusion during HFV is minimal, but a significantly greater effect of diffusion is present during CMV. GRA

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A89-36819* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

PLANETARY ENVIRONMENTS AND THE CONDITIONS OF LIFE

S. CHANG (NASA, Ames Research Center, Moffett Field, CA) (Royal Society, *Discussion on the Solar System: Chemistry as a Key to its Origin*, London, England, July 15, 16, 1987) Royal Society (London), *Philosophical Transactions, Series A* (ISSN 0080-4614), vol. 325, no. 1587, July 29, 1988, p. 601-610. refs

Geophysical models of the first 600 Ma of the earth's history following accretion and core formation point to a period of great environmental disequilibrium. In such an environment, the passage of energy from the earth's interior and from the sun through gas-liquid-solid domains and their boundaries with each other generated a dynamically interacting, complex hierarchy of self-organized structures ranging from bubbles at the sea-air interface to tectonic plates. The ability of a planet to produce such a hierarchy is speculated to be a prerequisite to the origin and sustenance of life. The application of this criterion to Mars argues against the origin of Martian life. B.J.

A89-37567 Worcester Polytechnic Inst., MA.

CHEMICAL MODEL FOR VIKING BIOLOGY EXPERIMENTS - IMPLICATIONS FOR THE COMPOSITION OF THE MARTIAN REGOLITH

ROBERT C. PLUMB, REWAT TANTAYANON, MARK LIBBY, and WEN WEN XU (Worcester Polytechnic Institute, MA) *Nature* (ISSN 0028-0836), vol. 338, April 20, 1989, p. 633-635. Research supported by NASA and Worcester Polytechnic Institute. refs

The labelled-release and the gas-exchange experiments of the 1976 Mars Viking biology experiment program detected, respectively, C-14 labelled gases and O₂ gas. A chemical model is proposed here for these experiments in which the reactants are an inorganic nitrate salt which has been partly photolyzed by ultraviolet light and a sparingly soluble metal carbonate such as calcite. The model reproduces the main effects seen, indicating that nitrates are present in the Martian regolith as well as calcite (or some other carbonate with similar solubility). C.D.

A89-37575* Nijmegen Univ. (Netherlands).

TEMPLATE-DIRECTED OLIGOMERIZATION CATALYZED BY A POLYNUCLEOTIDE ANALOG

J. VISSCHER, C. G. BAKKER, R. VAN DER WOERD, and ALAN W. SCHWARTZ (Nijmegen, Katholieke Universiteit, Netherlands) *Science* (ISSN 0036-8075), vol. 244, April 21, 1989, p. 329-331. refs

(Contract NGR-05-067-001)

A pyrophosphate-linked analog of polycytidylic acid has been synthesized and shown to catalyze the oligomerization of the complementary monomer 2'-deoxyguanosine 3',5'-bisphosphoimidazole. Analogs of polynucleotides are of interest in studies of the origins of life as possible precursors of the first RNA molecules. These results demonstrate that such molecules are capable of serving as templates for further synthesis. Author

A89-39177

THE EARTH'S ATMOSPHERE AND THE ORIGIN AND EVOLUTION OF LIFE [ATMOSFERA ZIEMI A POCODZENIE I EWOLUCJA ZYCIA]

MIECZYSLAW SUBOTOWICZ (Lublin, Uniwersytet, Poland) *Postepy Astronautyki* (ISSN 0373-5982), vol. 21, no. 3-4, 1988, p. 15-32. In Polish. refs

The development of an AI-based experiment support system for the JEM is discussed. The feasibility of the concept is examined and results from tests using a system prototype are presented. Consideration is given to the development of two prototype subsystems: an electric manual system to convert the experiment manual into a knowledge base and a mission scheduling system for use in planning experiments. R.B.

N89-22328*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

A COMPARISON OF AN ATPASE FROM THE ARCHAEBACTERIUM HALOBACTERIUM SACCHAROVORUM WITH THE F1 MOIETY FROM THE ESCHERICHIA COLI ATP SYNTHASE

HELGA STAN-LOTTER and LAWRENCE I. HOCHSTEIN Mar. 1989 20 p (NASA-TM-101014; A-88247; NAS 1.15:101014) Avail: NTIS HC A03/MF A01 CSCL 06/3

A purified ATPase associated with membranes from *Halobacterium saccharovororum* was compared with the F sub 1 moiety from the *Escherichia coli* ATP Synthase. The halobacterial enzyme was composed of two major (I and II) and two minor subunits (III and IV), whose molecular masses were 87 kDa, 60 kDa, 29 kDa, and 20 kDa, respectively. The isoelectric points of these subunits ranged from 4.1 to 4.8, which in the case of the subunits I and II was consistent with the presence of an excess of acidic amino acids (20 to 22 Mol percent). Peptide mapping of sodium dodecylsulfate-denatured subunits I and II showed no relationship between the primary structures of the individual halobacterial subunits or similarities to the subunits of the F sub 1 ATPase (EC 3.6.1.34) from *E. coli*. Trypsin inactivation of the halobacterial ATPase was accompanied by the partial degradation of the major subunits. This observation, taken in conjunction with molecular masses of the subunits and the native enzyme, was consistent with the previously proposed stoichiometry of 2:2:1:1. These results suggest that *H. saccharovororum*, and possibly, *Halobacteria* in general, possess an ATPase which is unlike the ubiquitous F sub o F sub 1 - ATP Synthase. Author

N89-22329*# National Aeronautics and Space Administration, Washington, DC.

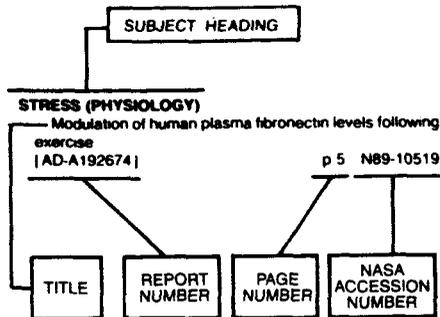
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YUK LING YUNG, LOUIS J. ALLAMANDOLA, THEODORE BUNCH, SHERWOOD CHANG, JOHN R. CRONIN, GEORGE U. YUEN, DOUGLAS J. DEFREES, SAMUEL EPSTEIN, EVERETT K. GIBSON, JR., MARTHA S. HANNER et al. May 1989 63 p (Contract NASW-4324) (NASA-TM-4121; NAS 1.15:4121) Avail: NTIS HC A04/MF A01 CSCL 06/3

Presented is a list of 1987 publications resulting from research pursued under the auspices of the NASA Exobiology Program.

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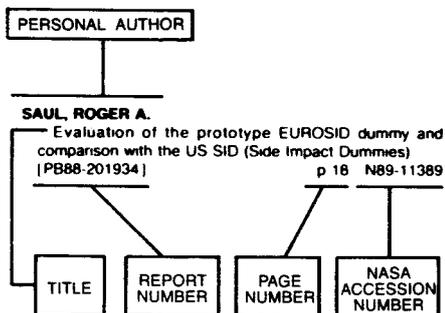
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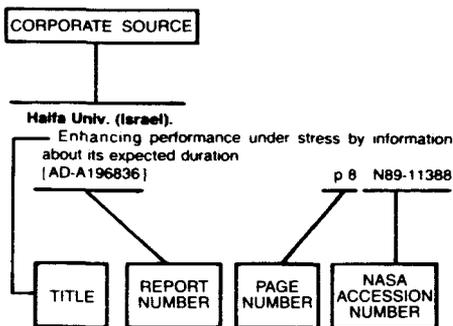
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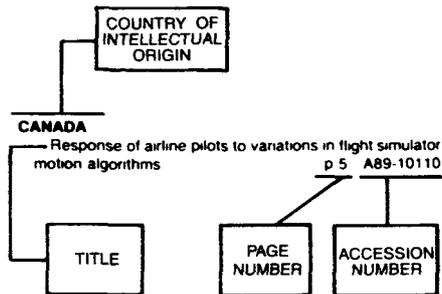
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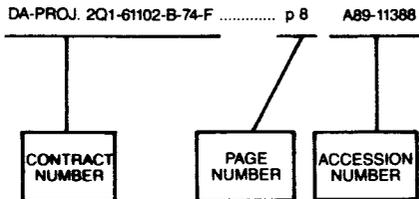
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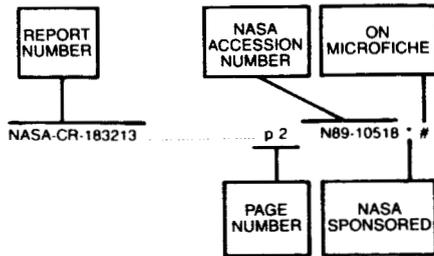
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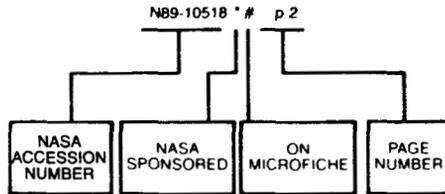


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